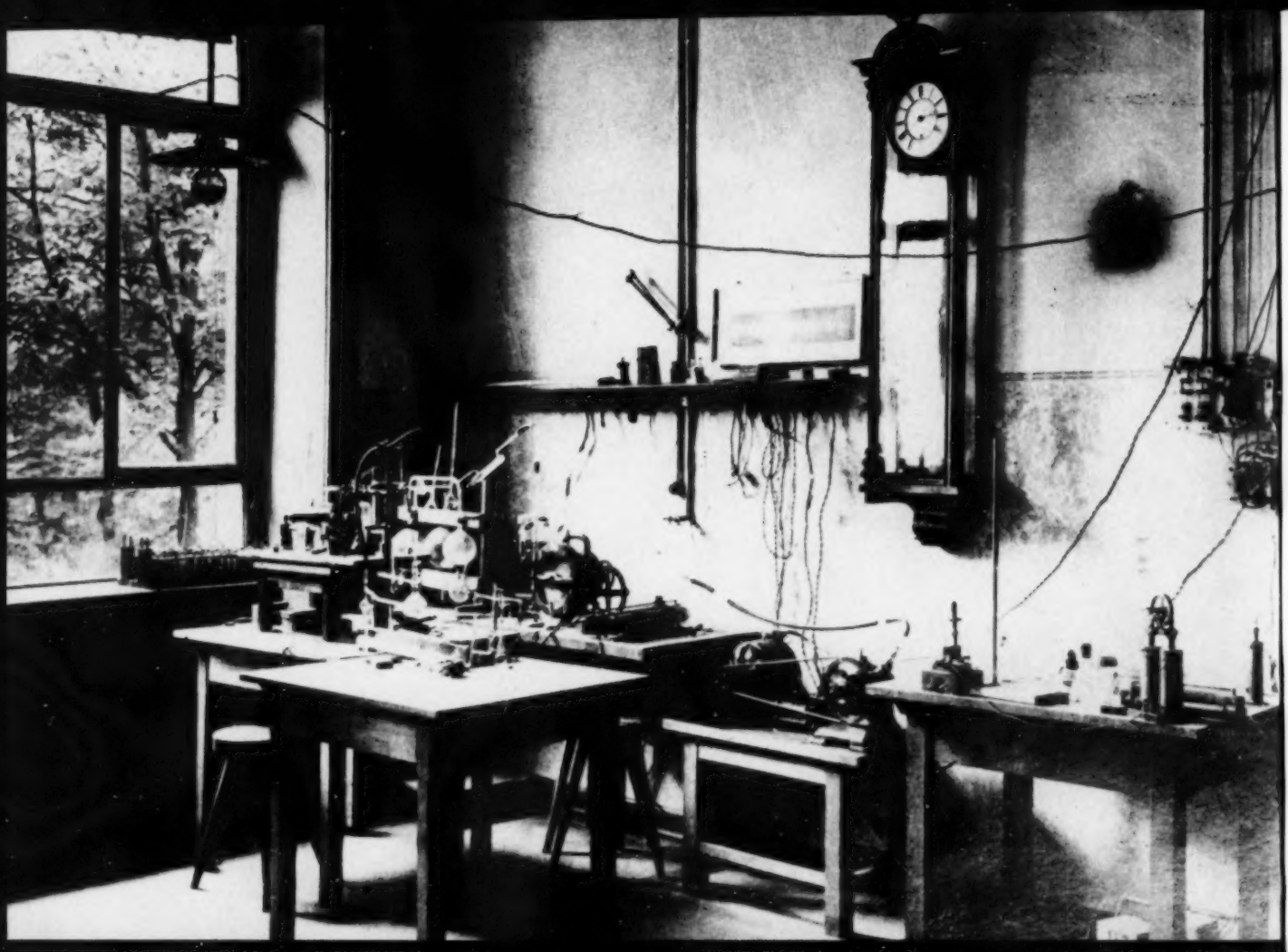
PUBLIC HEALTH REPORTS

In this issue

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service



Roentgen's Laboratory—from Otto Glasser's "Wilhelm C. Roentgen," London 1933

diagnostic radiology

see overleaf

Volume 69 Number 11 **November 1954**

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The X-ray and Diagnostic Radiology

The frontispiece, a reproduction of an old photograph, shows Dr. Roentgen's laboratory in Wurzburg, Germany. It was here in 1895 that he reported on his discovery of the rays which now bear his name. Professor Roentgen, however, termed them X-rays, because their nature was unknown.

Early X-ray equipment was awkward to use and inefficient. Early radiologists frequently complained that they spent more time maintaining the equipment than using it. Physicians had to be their own mechanics and electricians. Electrodes would overheat and melt. Power was obtained through the use of inductor coils or static machines. High tension wires were strung across radiographic rooms, with little regard for the hazards involved.

The first users of roentgen ray equipment were unaware of the dangers of radiation. At the turn of the century, physicians would demonstrate the painlessness of the technique to their patients by placing their hands into the ray. This method also served to test the ray's penetrative strength. In those days it took 20 minutes to get an exposure and 2 to 3 hours to develop a picture. The results were unreliable. While people were still worrying whether the ray might be used by unscrupulous persons to read the letters in metal mailboxes, Clarence M. Dally, an assistant of Thomas Edison, became radiation's first victim in 1904.

The major use by physicians in the early 1900's was to visualize fractures and locate foreign metallic bodies. In 1900, the American Roentgen Ray Society was formed in St. Louis by a group of physicians who believed in the diagnostic possibilities of the X-ray.

The improvements in the early equipment began when the induction coil gave way to the high-tension alternating current transformer. Rectification systems utilizing both phases of alternating current waves were added. In 1913, the hot cathode tube was developed. The rectifiers were replaced with a valve tube rectifier. Other tube developments have been the shockproof tube, the "ray-proof" tube, and the rotating anode tube.

Double emulsion films took the place of the glass plates which were in use until about 1920. Another development produced a grid which minimized scattered rays. The spot-film apparatus was another important improvement.

A half century of progress has been dramatic in this field. The trends in diagnostic radiology today are discussed in this issue by Dr. Theodore Hilbish on page 1017.

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Published concurrently with this issue:

PUBLIC HEALTH MONOGRAPH No. 23 . . . Biological factors in the transmission of American arthropod-borne virus encephalitides.

Frederick F. Ferguson.

37 pages. A summary and information on availability appear on pages 1095–1096.

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The use of contrast media and serialographic examinations, as well as other recent advances in the field of diagnostic radiology, reported here, is leading to greater diagnostic acumen and therapeutic advances heretofore unsuspected.

Developments in Diagnostic Radiology

By THEODORE F. HILBISH, M.D.

EVER since the discovery of the X-ray by Roentgen in 1895, the utilization of this invisible ray as a diagnostic adjunct in the field of medicine has increased by leaps and bounds. Not only has the use of the X-ray beam increased, but the development of accessory materials, such as the newer contrast media, has widened the horizon of diagnostic application of this ray. Furthermore, the engineering of special radiographic equipment, including the designing of miniature film X-ray units—for 35-mm., 70-mm., and 4- by 5-inch films—and the application of the principle of phototiming, has made practical the screening of the general public for the detection of tuberculosis, heart disease, lung carcinoma, and of other major diseases.

The purpose of this brief presentation, however, is to direct a few comments toward some of the recent trends and developments in the field of diagnostic radiology. As a matter of convenience, some of the early experiences in the operation of the Diagnostic X-ray Department of the Clinical Center at the National Institutes of Health, Public Health Service, will be mentioned since these experiences are pertinent to this discussion.

Serialographic Ureterograms

One of the new radiographic methods investigated at the Clinical Center is that of obtaining serialographic ureterograms. This study is a direct outgrowth of our numerous discussions with radiologists, gynecologists, and urologists concerning a common problem, the radiological detection of minimal ureteral strictures. Many female patients seek gynecologic consultation because of symptoms of costovertebral pain or because of some other manifestation which suggests partial urinary tract obstruction. Yet, our routine intravenous pyelographic films almost invariably fail to demonstrate evidence of pathology. Largely because of the interest of the urologist at the Clinical Center in this sub-

Dr. Hilbish, the chief of the Diagnostic X-ray Department, Clinical Center, National Institutes of Health, Public Health Service, Bethesda, Md., also serves as radiologist for Johns Hopkins Hospital, Baltimore, and instructor at Johns Hopkins University. Formerly, he was chief of the Radiology Section and assistant chief of the Tuberculosis Control Division of the Public Health Service, 1947–48, and 1948–49, respectively.

This review is based on a paper presented by Dr. Hilbish to the Maryland Radiological Society at its second annual meeting, May 1954, in Hagerstown.

ject, we decided to attempt a solution to the problem by using some of the new diagnostic equipment at the Clinical Center. We believed that the most logical approach would involve a physiological study of the urinary system. An overdistention of the urinary tract by retrograde pyelography or the introduction of a foreign body, such as a ureteral catheter, was certain to disturb the physiology of the urinary tract. As a result of much discussion and planning, the procedure described below was adopted.

After the patient to be examined has been moderately dehydrated, she reports to the X-ray department where she is given an intravenous injection of 50 cc. of 70 percent urokon, a dye used as the contrast medium. This injection is given rather slowly through an 18-gauge needle. It is immediately followed by approximately 300 to 400 cc. of 5 percent glucose in water, which is administered through the same needle from an intravenous flask.

Following administration of the glucose solution, which usually takes about 8 to 10 minutes, serialographic films of the urinary tract are made with a Sanchez-Perez serialographic X-ray unit. They are taken at the rate of 1 film every 2 seconds for a total of 12 films. The quantities of urokon and intravenous glucose to be injected, as well as the rate of serialographic filming to be followed, were determined as the result of preliminary experience. The method described, which is currently in operation at the center, was found to be the most effective so far as demonstration of evidence of pathology in the ureters is concerned.

Films which have been obtained in this manner are first studied radiographically by placing them on an X-ray film viewbox in serial order. By so doing, it is possible to visualize and evaluate carefully every section of the urinary tract. The X-ray films may then be placed in register and photographed with a motion picture camera. The films so obtained are then projected on a screen so that the physiological action of the urinary tract can be evaluated. Our experience indicates that more reliable information can be obtained, however, by carefully evaluating each X-ray film in serialographic order when it is on the viewbox. Films obtained with the Sanchez-Perez unit reveal

Figure 1. Ureterogram showing contraction of the ureters with passage of contrast substance down the ureters.

ureteral peristalsis as the contrast medium passes down the ureters. This is clearly demonstrated on the original films and may be seen in the illustration (fig. 1). A composite illustration (fig. 2) demonstrates the passage of the urokon down the ureter.

This method of serialographic examination of the ureters and kidneys is relatively new. So far as can be determined, this type of examination has not been performed in this manner elsewhere. A recent review of the literature reveals that Johnson (*1*) used the Sanchez-Perez apparatus in his study of ureteral peristalsis in 1952. In his initial work, Johnson used 40 cc. of 35 percent diodrast as the contrast medium but did not administer the 5 percent intravenous glucose. Likewise, 8 serialographic films, rather than 12, were obtained.

Since this method of examination is relatively new, the procedure is still in the stage of evaluation. As of the present, however, with the use of serial uretography we have discov-

ered two patients with minimal ureteral strictures that were not detected by routine intravenous pyelographic studies. Likewise, by means of serial uretography, it has also been possible to exclude the presence of a kidney tumor in a physician examined at the center. In that instance, the intravenous pyelogram demonstrated what appeared to be a defect of the right kidney pelvis. Serialographic films obtained according to the method described revealed filling of the right renal pelvis as well as good contraction of this segment of the collecting system.

The Schönander Unit

Within the past decade, the use of contrast media and of serialographic examinations has attracted a great deal of interest. The improvement of the diagnostic acumen of physicians who are using angiocardiographic studies and the advances in cardiac surgery during this period have made possible corrective therapy in selective cardiac abnormalities. Congenital heart lesions, such as tetralogy of Fallot, and many vascular aneurysms are now amenable to surgical treatment.

A Schönander biplane angiocardiographic unit, which is especially designed for biplane roentgenology, is in operation at the Clinical Center for detailed study of cardiac abnormalities by radiological methods. Since this is one of only two units of its kind in operation in this country at present, it is considered of sufficient interest to present an illustration of the apparatus as well as to portray a few early results obtained with it.

The Schönander biplane angiocardiographic unit and its two filming areas, the one horizontal and the other vertical, are pictured in figure 3. The same unit in conjunction with a radiographic table, which is placed horizontally over the filming area to support the patient during angiocardiographic study, is shown in figure 4. The table is entirely portable and is moved out of the way when it is not in use.

The Schönander unit makes possible many combinations of filming which we are finding most useful. Films may be taken independently in either plane, at any sequence desired, or films may be taken in both planes simultaneously, at a rate of as many as six films a second. They are 14- by 14-inch cut film and are transported independent of the cassette-holders or film frames.

Aortograms, splenograms, and cerebroarteriograms (figs. 5, 6, and 7) are examples of special studies which can be successfully performed with the Schönander angiocardiographic unit.

In the first instance (the aortogram, fig. 5), the patient was a white woman who had been admitted to the Clinical Center with a history of shortness of breath, ankle edema, as well as other manifestations of cardiac failure. Angiocardiographic films obtained by the retrograde insertion of a catheter into the femoral artery

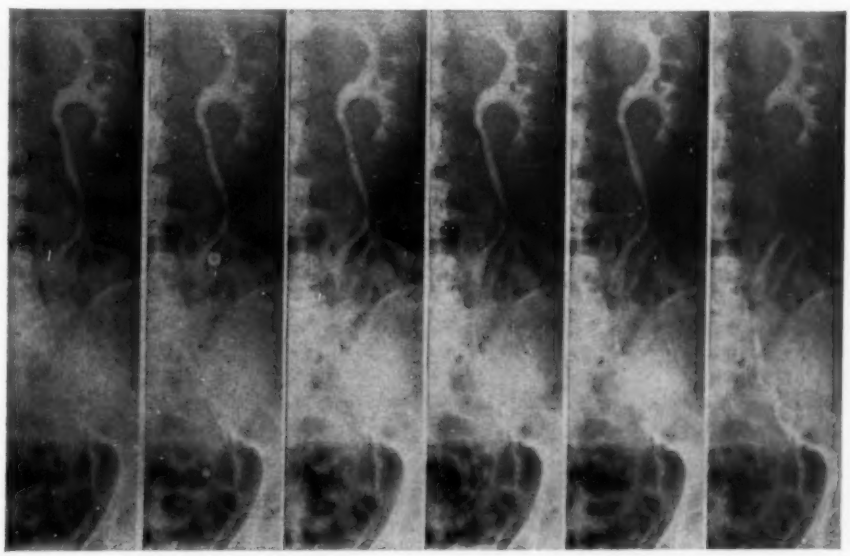


Figure 2.

Composite illustration showing ureteral peristalsis and passage of dye down the ureter. These serialographic films of the ureter were taken at 2-second intervals.

show a large aneurysm of the ascending aorta, which is partially filled by contrast substance. The extremely thick wall of the aneurysm is well demonstrated in the film pictured. When the subsequent operation was performed on the patient, this thick wall was found to be the result of thrombus formation.

A splenogram, shown in figure 6, was performed on a 50-year-old white woman, who had been admitted to the center with a history of hepatic enlargement and several episodes of hematemesis. This study was undertaken in order to rule out the possibility of portal obstruction and the possibility of resulting esophageal varices. As can be observed from the illustration, the presence of portal obstruction could be entirely excluded by this examination.

A cerebroarteriogram was performed on a 27-year-old white man who had been admitted to the center because of epileptic seizures of several years' duration. The examination in this study combined cerebroarteriography and pneumoencephalography. It can be seen from figure 7 that there was a considerable quantity of air within the ventricular system as a result of the preceding pneumoencephalogram.

These cases are reported as examples of how the Schönander unit has been used at the Clinical Center. The taking of films in both planes simultaneously reduces the number of injections and the quantity of injected material by one-half, an improvement which results in considerably less discomfort to the patient and likewise appreciably reduces the hazards associated with examinations of this type.

Image-Intensifying Tubes

As might be expected in a research institution such as the Clinical Center, various research investigators have presented new diagnostic problems to the Diagnostic X-ray Department. For example, a preliminary study was recently directed toward the cineradiography of a contrast substance within the aorta in an effort to study the flow pattern in this vessel. In order to accomplish a study of this type, obviously some special instrument must be provided which will intensify the fluorescent image to such magnitude as to permit photography on a motion picture film. This we attempted by using a Phillip's fluorescent image-intensifying tube.

Figure 8 shows this apparatus in use during the first attempt at consummating the procedure

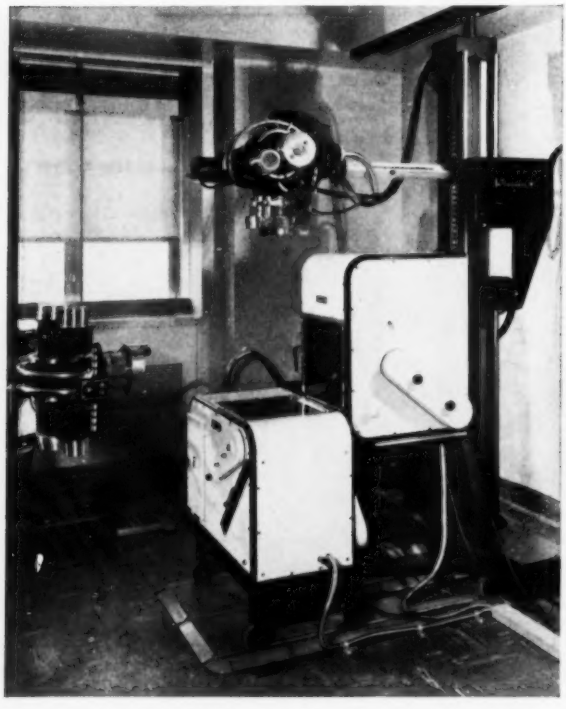


Figure 3. The Schönander biplane angiocardiographic unit. Horizontal and vertical filming areas can be seen.

Figure 4. Patient lying on radiographic table for angiocardiographic study. Note X-ray tubes for anterior-posterior and lateral filming.

Figure 5. This retrograde aortogram reveals a large aneurysm of the ascending aorta.

just outlined. This particular image-intensifying tube provided an intensification factor of 1,100 times. The preliminary study was accomplished by instilling drops of iodochloral into the aortic arch of a dog by means of a retrograde catheter inserted into the femoral artery.

From this experience, it was learned that the contrast medium could be readily seen in the aorta, but owing to its extremely rapid course down this vessel it could not be followed by the human eye. The next attempt at consummating this examination will involve the photographic recording of the oil droplets in the aorta and then the slow motion projection of the films obtained in order to study the course of the oil droplets in their passage down the aorta. The purpose of this study is to delineate the etiological factors responsible for arteriosclerosis and other changes occurring in the large vessels of the human body. Still in its infancy, this work has yet to advance to a degree that will provide useful information.

The Phillip's fluorescent image-intensifying tube has been studied in the Diagnostic X-ray Department in connection with its use in general fluoroscopic examinations. It was found that with this apparatus patients could be fluoroscoped at one-quarter to one-half milliampere. In its present form, however, this particular image-intensifying tube is not practical since it requires binocular vision and it is quite unwieldy.

The Westinghouse X-ray Corporation has produced a more maneuverable unit of this

Figure 6.

A splenogram in which the contrast medium can be seen in the spleen, splenic vein, and portal system.

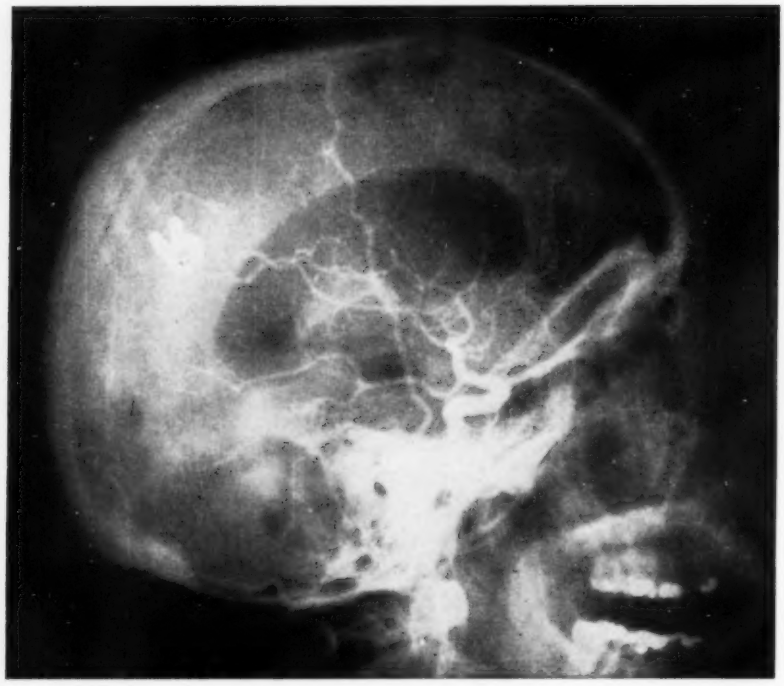


Figure 7.

This combination cerebroarteriogram and pneumoencephalogram shows air in the ventricular system and the contrast medium in the cerebral circulation.

type; it has a 5-inch viewing screen and is commercially available. But the Westinghouse unit like the Phillip's tube has definite limitations from the standpoint of maneuverability. Although fluorescent image intensification is still in the developmental stage, the process will undoubtedly play an extremely important role in diagnostic and experimental radiology within the next few years.

Other Developments

Another relatively new development in diagnostic radiology is the use of a bronchoscope as a means of passing a needle under direct vision through the carina and into the left atrium. The needle is used to determine the left atrial pressures. After pressure studies have been made on the patient, a contrast substance, such as 70 percent urokon, is injected directly into

Figure 8.

A fluorescent image-intensifying tube shown in conjunction with the performance of a retrograde aortogram.

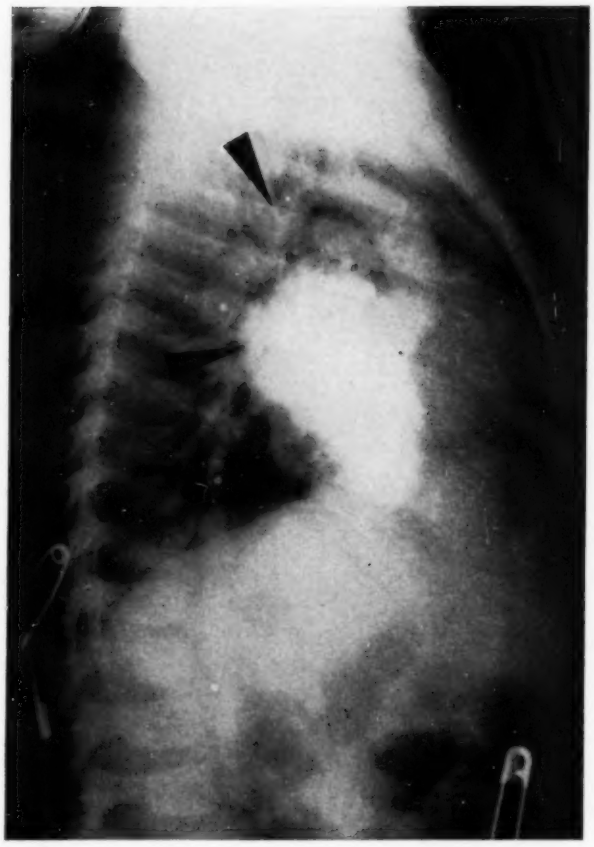


Figure 9. Angiocardiogram demonstrating a large left atrium with stagnation of the contrast substance and with an associated coarctation of the aorta.

the left atrium, and films are taken to determine the size of this cardiac chamber as well as to attempt the differentiation between mitral stenosis and mitral insufficiency. Although this procedure has been used in England, in this country its use is relatively new. In our limited experience with the method at the Clinical Center, no serious complications have occurred. On two occasions, a small quantity of the contrast substance was inadvertently injected into the pericardial sac, thereby resulting in transitory precordial pain, but there were otherwise no harmful effects.

Because of recent advances in cardiac surgery, a great deal of interest has been shown in another trend in diagnostic radiology—the use of angiocardiographic studies as a method of differentiating mitral stenosis from mitral insufficiency. The knowledge as to whether he is dealing primarily with mitral insufficiency or mitral stenosis is of extreme importance to the surgeon when he is planning surgical treatment. Angiocardiography is one method used at the Clinical Center for differentiating these two conditions. Since a decided difference of opinion still exists as to how reliable the method may be, it is hoped that a definitive answer to this question will be forthcoming soon.

The current opinion is that there is a greater stagnation of contrast substance and less dilu-

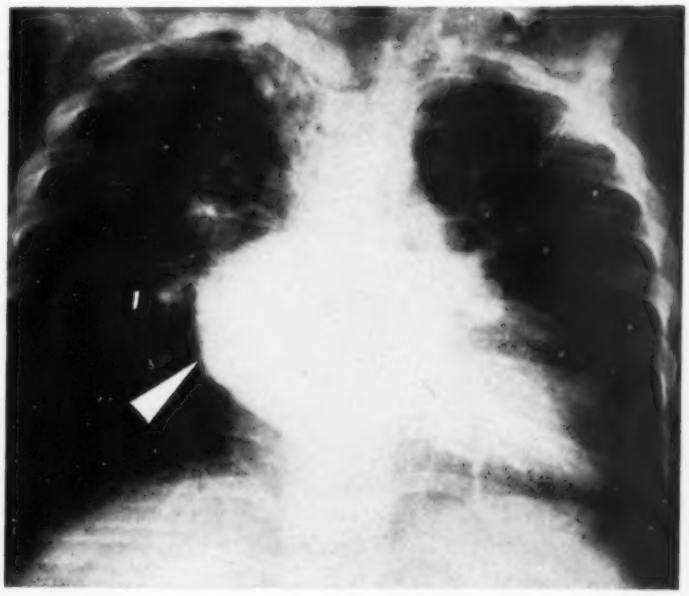


Figure 10.
Angiocardiogram demonstrating a large left atrium and stagnation of the contrast medium in this chamber.

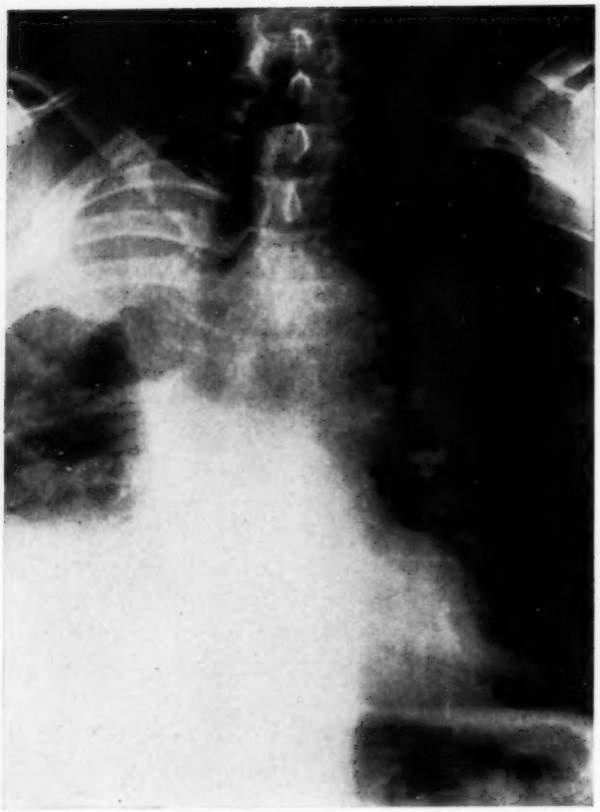


Figure 11. This film taken with conventional radiographic kilovoltage fails to reveal a tumor invading the left side of the trachea.

Figure 12. But use of 1-million volt equipment demonstrates that the patient has a carcinoma which is not visible in figure 11.

tion of the substance in the left atrium in cases of mitral stenosis than in cases of mitral insufficiency.

The two cases described below will serve to illustrate the use of angiocardiographic studies in differentiating these conditions.

As shown in figure 9, the contrast medium tends to pool in the left atrium. This study was conducted on a 2½-year-old white boy who had been admitted to the Clinical Center with a history of shortness of breath on exertion and of cyanosis about the lips. In the angiocardiogram, the contrast medium remained in high concentration within the left atrium throughout a period of 15 seconds. Based on angiocardiographic studies as well as on cardiac catheterization and clinical findings, the diagnosis in this case was that of predominant mitral stenosis with an associated coarctation of the aorta.

In the X-ray film pictured in figure 10, the patient studied was a white male child, aged 6 years. He was admitted to the center with a history of a systolic murmur which had been detected when he was 3 months old. In this contrast study, the left atrium was proportionately larger than in the preceding case, the contrast substance was diluted more rapidly, and it remained in the left atrium a shorter period of time. The opinion with respect to this patient was that of predominant mitral insufficiency. Clinical findings, cardiac catheterization, and angiocardiographic studies determined this diagnosis.

From recent experience at the Clinical Center, however, we have come to doubt seriously the reliability of angiocardiography as a method of differential diagnosis.

The use of high kilovoltage X-ray equipment as a means of determining the presence of tum-

Figure 13. A normal bronchogram performed with dionosil. A new trend is the use of contrast media readily eliminated from the lungs.

Figure 14. Twenty-four hours later. The contrast substance has been almost completely eliminated from the lung fields.

ors, particularly in the mediastinum, is creating interest, too. The term "high kilovoltage equipment" refers to apparatus providing at least 1-million-volt radiographs. X-rays produced at this voltage level will penetrate the dense structures of the body almost as readily as the soft tissues. Thus, a tumor situated in the mediastinum now becomes discernible, while previously with the use of conventional diagnostic kilovoltages, it most likely would have been obscured by overlying bony densities. This fact is demonstrated in figures 11 and 12, which are X-ray illustrations of a 50-year-old woman, who on admission to a hospital (in Philadelphia) complained of cough, shortness of breath, and hemoptysis. The X-ray film (fig. 11), which was obtained with normal radiographic kilovoltages, failed to demonstrate the tumor involving the left side of the trachea, but a film (fig. 12) taken with 1-million-volt equipment demonstrates a carcinoma.

It should be pointed out, however, that the use of laminography, and in selected instances, arteriography, to delineate tumors of the mediastinum, will produce comparable results. However, hospitals where million-volt equipment is available should consider the diagnostic possibilities of equipment of this type.

Using Contrast Media

Another recent trend in diagnostic radiology—particularly in the United States—is the use in bronchography of contrast substances which are readily eliminated from the lung fields. However, bronchography employing water soluble media has been practiced for several years in Europe, especially in England and Sweden. In a study of this type undertaken several years ago at the Johns Hopkins Hospital in Baltimore, some success was obtained with a product containing diodrast, suspended

in a 0.75-percent solution of methyl cellulose. The preparation, however, was quite irritating and difficult to retain in the bronchi long enough for satisfactory radiography. Recently, a product called dionosil, which consists of 30 percent iodine suspended either in water or oil, has been found to be an efficient agent for bronchography. Dionosil has the advantage of being readily eliminated from the lung fields and has the further property of being evenly dispersed along the bronchi without pooling in the alveolar spaces. It does have, however, a disadvantage similar to that of diodrast, namely, that it is more irritating than the ordinary oily substances commonly used for bronchography, such as iodochloral or lipiodol.

An excellent bronchogram performed with dionosil in Baltimore is portrayed in figure 13. As can be seen from a second illustration (fig. 14), which was taken 24 hours after the initial bronchogram, the material has been almost entirely eliminated from the lung fields.

The next step, of course, is to develop a method of micronizing powder to such extent that the material can be dispersed along the bronchial tree by nebulization, thus eliminating the time-consuming and, at times, difficult problem of introducing the contrast substance by intratracheal catheter. A low surface-tension agent such as tween 80 would be necessary to help disperse the material into the terminal bronchi. It is hoped that these potential simplifications of bronchography may be further evaluated at the Clinical Center.

Xeroradiography

Mention should also be made of the development of xeroradiography by Dr. John Roach, chief radiologist at the Albany Hospital, Albany, N. Y., and Dr. Hefman Hilleboe, New York State health commissioner. This new procedure is still under investigation by its originators and may eventually serve a very useful purpose in public health. It involves the use of a chemically coated aluminum plate, which is charged electrostatically and then exposed to radiation. The charge is dispersed by the radiation in direct proportion to its intensity, which, in turn, is governed by the density of intervening tissues. Next, a fine powder is dusted on the charged plate. The powder adheres in greatest quantity to those areas carrying the greatest charge, hence, the formation of the X-ray image.

Color Radiography

During, and shortly after the First World War, much interest in color radiography was stimulated by a French investigator. However, upon careful investigation, the initial claims proved to be somewhat of a hoax and were never proved to have practical application. Recently, however, interest in color photography has been restimulated, and further claims have been made relative to its application. However reliable or beneficial will be the results of the recent experiments in this field—most of which have been conducted in Canada—remains to be seen. On a theoretical basis, color radiography should be useful both as a teaching method and as a means of improving diagnostic acumen.

Radioactive Isotopes

Final mention should be made of two isotopes—thulium-170 and xenon-133—which have recently been utilized on a limited scale as sources of energy for diagnostic radiology. Portable sources of X-ray energy containing thulium-170 and weighing less than 7 pounds have been constructed at the Argonne National Laboratory in Illinois. The radiant energy is self-contained in a lead shield and is released through a shutter which is remotely controlled.

These portable X-ray units have an output of 75 roentgens an hour at a distance of 1 inch. In their present stage of development, they are practical only for the X-raying of small extremities. It is anticipated that a new thulium source will be developed which will have an output of approximately four times that of thulium-170. With this new source of energy and high speed X-ray screens, it should be possible to obtain diagnostic X-ray films of small extremities with exposure factors of 1 to 3 seconds.

Undoubtedly, thulium units will never replace diagnostic X-ray equipment, but it is conceivable that these small, portable X-ray units

may have some practical value in localities where X-ray equipment is not available. Both thulium-170 and xenon-133 have been used in England as an intraoral source of energy for radiography of the teeth and mandibles. The quality of the films obtained, however, does not compare favorably with that obtainable with ordinary radiographic units. Thulium-170 has a half life of 129 days, which considerably limits the practical use of this isotope in radiography. However, thulium-170 may well serve as an excellent source of constant radiant energy for diagnostic and research investigations such as, for example, in electrokymography.

The preceding discussion has touched on some of the current highlights insofar as recent trends and developments in radiography are concerned. The almost constant improvement of electronic devices and equipment will inevitably alter the future diagnostic, and for that matter, therapeutic, applications of radiographic equipment. For example, with the so-called "storage tube," which may ultimately be used in diagnostic radiology, it is possible to examine fixed objects by using very short radiographic exposures and then to store the resulting picture on the grid of the storage tube. The X-ray unit may then be switched off, and the picture may be subsequently examined as long as is desired. In this manner, the possibility of radiation exposure to a patient may be greatly reduced.

REFERENCE

(*1*) Johnson, T. H.: Peristalsis of the upper urinary tract as demonstrated by new X-ray technic. A preliminary report. New York J. Med. 52: 189–196 (1952).

NOTE: Illustrations were provided through the courtesy of Dr. Eugene P. Pendergrass, University of Pennsylvania (figures 11 and 12) and Dr. James K. Wilson, Johns Hopkins University Hospital (figures 13 and 14).

Commissioned Corps Reserve To Be Expanded

Expansion and reorganization of the Inactive Reserve of the Public Health Service as part of an intensified civil defense program in the Service is announced by Surgeon General Leonard A. Scheele.

The new program calls for the recruitment of an additional 5,000 Reserve Corps officers during the next year and a half—2,000 by June 30, 1955, and an additional 3,000 by June 30, 1956. Dr. Scheele called on all commissioned officers and key civil service personnel of the Service to assist in the recruitment program.

Expansion and reorganization of the Inactive Reserve is part of an intensified civil defense program in the Service resulting from presidential approval of a Federal Civil Defense Administration delegation to the Department of Health, Education, and Welfare.

Under this delegation, the Public Health Service has new responsibilities for developing technical guidance for the States and directing Federal civil defense activities concerned with detection and control of communicable diseases, the public health aspects of chemical and biological warfare, and other public health hazards.

"Ultimate objective of the plan," Dr. Scheele said, "is the creation of a pool of trained physicians, sanitary engineers, nurses, and associated professional health personnel who can be immediately mobilized and selectively deployed to reinforce State and local health forces in times of emergency. Experience during World War II and since leaves no room for speculation as to the need for a well-organized Inactive Reserve, large enough to be effective, adequately trained, and ready for rapid mobilization."

As the expansion gets under way, field training courses will be instituted for both present officers of the corps and newly recruited officers. The initial emphasis, Dr. Scheele said, will be on the recruitment and training of physicians, nurses, and engineers.

Inquiries concerning commissions in the Inactive Reserve should be addressed to the Surgeon General, Public Health Service (P), United States Department of Health, Education, and Welfare, Washington 25, D. C., or to the nearest regional office of the Public Health Service.

The Design of Public Health Programs For Underdeveloped Countries

By JOHN J. HANLON, M.D., M.P.H.

DURING the past quarter century, the growth of activity toward the improvement of the public health has been unprecedented. Although this has occurred throughout the world, necessarily the degree, direction, and method have been subject to considerable variation. On the one hand are a number of usually older and economically more fortunate nations which have moved in the main stream of recent history and social development. These have experienced a continuous improvement in their standards of living, a most important characteristic of which has been the evolution of adequate medical care and sound public health activities resulting in a longer and healthier life. On the other hand are a large number of countries, often new as independent nations and generally underdeveloped, in which the advantages of modern medicine and public health have been inadequately available up to the present.

Dr. Hanlon since 1952 has been chief of the Public Health Division of the Foreign Operations Administration. His previous work in the field of international health has included positions as medical director and as chief of the Institute of Inter-American Affairs' field health party in La Paz, Bolivia. *The paper presented here was read before the section on preventive and industrial medicine of the American Medical Association's 103d annual meeting, which was held in San Francisco, June 21–25, 1954.*

Largely by virtue of improved health and increased length of life, one group of nations has been able to achieve great economic, agricultural, and industrial development and to obtain widespread educational and social benefits for the majority of their people. Many of the other group, however, remain handicapped by overwhelming backlogs of preventable illnesses which delay or preclude a desirable physical development of their people and the effective utilization of their resources.

The Vicious Circle

The relationship between disease and the various economic, social, and political conditions represents, of course, a vicious circle. Disease breeds poverty, and poverty in turn breeds more disease. Disease, illiteracy, political instability, and many other factors are similarly related. It is difficult, if not impossible, to state which factor is primary, which is cause and which is effect. Once the circle is established, however, each factor contributes to the continuance of all other undesirable factors. This is what is termed cumulative causation.

Shown in the accompanying table are data on the health, economic, and educational conditions in the more developed regions and the less developed regions of the free world, which illustrate this circle relationship. Included in the generally more developed regions are North America, Western and Southern Europe, Au-

stralasia, and Japan; and in the generally less developed regions, Latin America, Southeastern Europe, the Near East, Africa, and South and Southeast Asia. (For the sake of depicting broad geographic areas of relative development and for convenient statistical handling, certain countries which are obvious exceptions to the region in which they are located are nevertheless included in that region.) From these data, it can be seen, first, that twice as many people live in the less developed regions than in those that are more developed. Beyond this, in every phase of development measured, the less developed regions are significantly disadvantaged in comparison with the more developed regions.

Until relatively recently, it was possible for such disparity to exist without conditions and events in one area affecting those in another. However, in a shrinking world characterized by rapid international and intercontinental transit, by increasing trade, and by increasingly complex international economic and political interdependence, this is no longer the case. History has reached the point where neither the United States nor any other nation can enjoy the fruits of peace and prosperity except in company with their fellow men and their fellow nations.

Comparison of economic, health, and educational conditions in the more developed and less developed regions of the free world

Condition	More developed regions	Less developed regions
Population, 1950 (millions)	534. 0	1, 061. 0
National income, 1949 (dollars per capita)	690. 0	70. 0
Nonhuman energy, 1950 (metric tons of coal per capita or equivalent)	3. 8	. 2
Percentage of men in nonagricultural employment	73. 0	33. 0
Births per 1,000 population, 1950	21. 7	43. 5
Deaths per 1,000 population, 1950	10. 5	25. 9
Infant mortality per 1,000 births, 1950	45. 0	183. 0
Expectation of life (years)	63. 0	34. 0
Crop yields (bushels per acre):		
Wheat, 1949–51	26. 0	13. 0
Rice, 1949–50 and 1951–52	69. 0	30. 0
Calories per person per day	2, 800	2, 000
Animal protein per day (ounces)	1. 4	. 4
Persons per physician, 1945–50	1, 000	14, 000
Illiterates per 100 persons:		
Males	5	64
Females	7	83
Elementary school teachers per 1,000 population	3. 6	1. 3
External trade, 1949 (dollars per capita)	140. 0	32. 0
Consumption of textiles, 1948 (pounds per capita)	21. 0	5. 0

The Government of the United States, through declaration of policy as contained in acts of Congress and pronouncements of the President and the Secretary of State, has expressed the belief that the chances for world peace, world prosperity, and world progress would be much brighter if conditions of ill health, poor diet, lack of knowledge, and low standards of living could be changed for the better. It is therefore attempting to break the insidious circle by assisting, particularly, the less developed countries of the free world to help themselves raise their standards of living. From the beginning of the United States bilateral technical assistance programs, the improvement of health has been one of the primary goals.

A New Approach in Planning

In the emergency circumstances in which the United States technical assistance programs developed—during World War II in Latin America and soon after the war in other areas—the drive was to recruit effective and experienced personnel as quickly as possible, to supply them with the means for getting things done, and to obtain early results. There was insufficient time for as complete and as careful planning as was desired. There was little experience to draw on, and pressures were great from all sides. Despite these conditions, it is generally conceded that a great deal was accomplished.

More recently, however, there has been time for taking a new look at these programs. Increasingly, it has been realized that some system of priorities in health technical assistance to underdeveloped countries is essential since health needs are so vast and the resources in funds and trained personnel are so limited. Furthermore, a health technical assistance program must be based on a clear consideration of all the elements concerned in it. It must be shaped with thought, not by luck. Depending

for success upon cooperation with other governments, it obviously must consider their wishes but must also avoid giving way to inadvisable expediency.

Accordingly, in August 1953, a series of priorities, representing the results of thoughtful consideration of the matter by experienced workers in the international health field, was developed. It was formulated at a 3-day conference of professional personnel of the Public Health Division of the Foreign Operations Administration, the Division of International Health of the Public Health Service, and the Division of International Cooperation of the Children's Bureau. The group consisted of 12 persons and included members of all the major health disciplines. Significantly, every one of the 38 countries in which United States technical assistance programs in health are being conducted had been worked in or visited officially by one or another member of the group.

The first step was to consider certain elemental questions. What are the fundamental purposes and aims of United States technical assistance programs? Is there really a place for health activities in the technical assistance programs? If so, which health activities should be given consideration? In answer to these questions, it was determined that beyond the obvious humanitarian and scientific reasons, United States technical assistance programs in health were justifiable on two bases:

1. The extent to which they strengthen the economies of other nations by health benefits which release effective human energy, improve citizen morale, improve environment for local and foreign investment, and open new land and project areas.

2. The extent to which they contribute to desirable political objectives by aiding the stability of governments, by reaching large populations with highly welcomed personal service programs, and by demonstrating the United States' deep human interest in man and his dignity.

The various bases upon which health activities in technical assistance programs should be chosen and judged were then discussed, the general program goals and justifications being kept constantly in mind. Two features of the programs were emphasized: (*a*) The period of time in which the United States will be working in these countries is limited; (*b*) the basic purpose is to show other countries how they may do the job themselves rather than to try to do the job for them. For many reasons, it was concluded that activities that can affect the welfare of large numbers of people within a relatively brief interval of time should be favored. It was noted also that, although a great many health activities have merit, certain of them are impractical for technical or scientific reasons or because of administrative or cultural difficulties.

These determinations led to the development of a chart for the classification of various program elements. Down one axis were listed the various types of health activities that had been previously suggested or engaged in or that conceivably might be suggested. Across the other axis were listed evaluation criteria, some of which have been referred to above: economic feasibility, political feasibility, technical feasibility in the light of present-day scientific knowledge, administrative feasibility, cultural acceptability, early recognizable results, results in relation to cost, take-over ability by host country, and number of persons affected. Each possible activity was thoroughly discussed in relation to each criterion under which it was eventually rated from zero to four plus. As a result, for the first time it was possible to look at activities in international technical assistance in health from an overall objective, yet relative, viewpoint.

Three Priority Categories

From the consensus developed with regard to each possible activity, the activities seemed to fall into three broad priority categories, as follows:

1. Of highest priority are activities or programs that are always and unquestionably justified wherever the related problems exist. Malaria control is perhaps the example par excellence. It is always politically and culturally acceptable; the necessary technical and scientific knowledge and tools are at hand; their use is administratively feasible; results are rapid, recognizable, and appreciated; large numbers of people are affected at very low cost

per person, a cost so low that the host country can practically always take over the maintenance job; and, finally, the total economy of the family, community, and nation is favorably affected by the activity.

2. Of secondary importance are activities or programs that would not be favored in the absence of special precise explanation and justification because of reservations with regard to one or several evaluation criteria. Thus, although antitrachoma programs may be favored on the bases of economic value and public and political acceptability, there may be some question about the technical feasibility of such programs in relation to certain organizational and administrative difficulties.

3. In the lowest category are activities or programs that are definitely not justified and that should not be a part of the technical assistance program except under unusual circumstances. In rare instances, certain peculiar nonhealth considerations might result in a decision to engage in one of these activities. In this category would fall most programs in the field of noncommunicable chronic disease, for example. In relation to conditions in practically all underdeveloped countries, such programs would receive low ratings under most of the criteria mentioned.

A summary of the activities included in each of the three priority groups follows.

FIRST PRIORITY

(*acceptable without justification*)

1. Mass campaigns against malaria and yaws, where they are major problems, and against selected gross nutritional deficiencies, such as kwashiorkor, beriberi, xerophthalmia, and goiter, where they may be readily attacked.

2. Development of small, protected community water supplies.

3. Demonstrations through health centers of services on a communitywide basis, including sanitation, communicable disease control, health records and statistics, home visiting, maternal and child health, nutrition, health education, laboratory, and general clinical services where required to gain acceptance of the community. Health centers should be used for subprofessional training and field experience for professional personnel and should be limited in scope and number to the national capacity to absorb and operate them.

4. Advice and assistance in strengthening and lending stability to the organization and operation of the public health administration of the host government.

5. Inclusion of training and health service projects in proposed or existing community or village development programs.

6. Advice and assistance in planning and designing, and supervision of construction, of hospitals, health centers, laboratories, and other health facilities.

7. Development and support of basic training of nurses to demonstrate the proper status of nursing as a profession and to provide leadership for indigenous training.

8. Training of subprofessionals to meet major specific health problems in preventive medicine, nursing, sanitation, limited medical services; such training to develop personnel for a planned program which must include professional supervision and periodic refresher training. Where practicable, opportunity should be given for advancement of outstanding individuals to higher levels.

9. Fellowships in public health, preferably project related, in the United States, not necessarily limited to 1 year, awarded to physicians, engineers, nurses, health educators, laboratory technicians, public health statisticians, and administrators. Training should be provided in the host country or region to the maximum extent possible.

10. Programs for training key medical school teachers in major clinical and preclinical specialties. Training should be provided in the host country or region to the maximum extent possible.

11. Construction of demonstration health centers and nursing schools when necessary to the success of these programs by insuring physically adequate, effective planned facilities.

SECOND PRIORITY

(*require explanation and justification*)

1. Mass campaigns against other diseases where of major importance; for example, trachoma, louseborne typhus, and leprosy.

2. Consultation on urban water or sewerage systems.

3. X-ray, audiovisual, or other major equipment for hospitals or health centers.

4. Excreta disposal projects, other than as an integral part of a community general sanitation program.

5. Refuse disposal, fly control, and food protection projects.

6. Assignment of United States personnel to foreign institutions, except on a short-term consultation basis (3 months or less).

7. Occupational health services.

8. Projects for tuberculosis immunization (BCG), case finding, and ambulatory treatment, where the problem warrants and facilities permit.

THIRD PRIORITY

(*only under most unusual circumstances*)

1. Mobile clinics requiring specialized motor equipment, or mobile clinics for general medical care.

2. Construction or financing of construction of hospitals, water and sewerage systems, or other major structures.

3. Operation of hospitals by United States personnel or at United States expense.

4. Training of practicing physicians in clinical specialties in the United States.

5. Dental health projects.

6. Mental hygiene projects.

7. Establishment, equipping, or operation of blood banks.

8. Medical rehabilitation projects.

9. Mass treatment for intestinal parasites.

10. Geriatrics projects.

11. Poliomyelitis control or treatment projects.

12. Training in tropical medicine in the United States.

It is fully recognized that any such priority grouping would not be subscribed to in every detail by all health technicians in all country programs at all times. Application of the list must be related to individual country conditions and the stage of development of its resources and health administration. Therefore, each of the health program chiefs has been urged to make, in cooperation with his staff and the host country counterparts, the same evaluation and program development analysis in terms of the problems and situations peculiar to the country in which he is working. Despite its limitations, it is believed that thoughtful application of this procedure on a country-by-country basis is resulting in a more consistent policy and greater effectiveness in attaining the objectives of the technical assistance programs.

Mental Health Training Grants Closing Date

The Public Health Service announces December 15, 1954, as the closing date for filing applications for training grants under the National Mental Health Act for the academic year 1955–56.

Applications for the support of projects on the development and evaluation of current and new teaching and training methods in psychiatry, clinical psychology, psychiatric social work, and psychiatric nursing will also be received. These projects may be for the purpose of assessing or evaluating the effectiveness of current training, or may propose an exploration of new methods of teaching intended to improve the quality of instruction in these fields. Preference will be given to projects containing evaluation procedures intended to assess the usefulness and effectiveness of the methods under study.

Application forms and additional information may be obtained from the Training and Standards Branch, National Institute of Mental Health, Public Health Service, Bethesda 14, Md.

Lung Cancer Mortality

Geographic Distribution in the United States for 1948–1949

By ERWIN F. HOFFMAN, M.D., M.P.H., and ALEXANDER G. GILLIAM, M.D., Dr.P.H.

DATA on geographic variation within the United States in mortality recorded from cancer of a number of sites, including cancer of the lung and pleura, have been published for the period 1930–32 by Gover (*1*). At that time deaths were allocated to the State in which death occurred rather than to place of residence. A study by the Bureau of the Census (*2*), however, indicated that a majority of the nonresident cancer deaths represented movement within States rather than between States. For this reason, Gover's comparisons between States were valid, but they could not be extended to urban-rural comparisons within States and could not directly take into account State differences in urbanization. Gover, however, did demonstrate for respiratory cancer, as well as for cancer of several other sites, that rates were highest in the States having the greatest portion of population living in urban areas. Since then, there has been abundant evidence from other countries that mortality from cancer of the lung is greater in urban than in rural areas (*3–5*) Since no direct comparisons of urban and rural rates are available for the United States, it is the purpose of this paper to present State rates adjusted for residence (urban-rural) in addition to age, race, and sex.

Dr. Hoffman, now assigned to the Bureau of Prisons, Department of Justice, as medical officer at the Medical Center for Federal Prisoners, Springfield, Mo., was formerly epidemiologist with the Epidemiology Section, National Cancer Institute, Public Health Service. Dr. Gilliam has been head of the Epidemiology Section since 1948. His previous assignments in the field of epidemiology have included positions at Johns Hopkins University School of Hygiene and Public Health and at the University of Michigan School of Public Health.

Material and Methods

The figures presented in this report were computed from basic death certificate data taken from special tabulations supplied by the National Office of Vital Statistics, Public Health Service. For 1948, cancer of the lung comprises International List numbers 47b, c, d, and e, and for 1949, numbers 162 and 163. Populations employed are those of the 1950 census. Urban population is that of the 1940 census definition and generally comprises those persons living in places of 2,500 or more people. Deaths were allocated to urban and rural categories according to the urban-rural status of the population in 1940. Use of the 1940 population status is not believed to introduce any important error in allocation of deaths within this broad urban-rural classification. The error would, however, be material if allocation were attempted on any finer division of the urban

population, short of using individual places. (The National Office of Vital Statistics, in studying urban-rural allocation of births, finds, in addition, that the overstatement for urban areas averages about 6 percent and that the understatement for rural areas averages 10 percent (*6*). A similar, but less pronounced, bias probably also operates in allocation of deaths.)

For comparison between States, adjustments are made by the indirect method, and rates are expressed in terms of the standardized mortality ratio (SMR), which has been so usefully employed in reports by the Registrar General of England and Wales. The SMR was computed as follows: The age, race, sex, and residence (urban-rural) specific rates for the entire United States were applied to the appropriate State populations to find the number of deaths expected in each State if United States rates prevailed; the number of deaths recorded in each State was then divided by the number of deaths expected, as obtained for each population category, and the quotient was multiplied by 100. The SMR is thus a ratio which takes account of the age, race, sex, and residence (urban-rural) composition of each State's population. The State rate, adjusted for these factors by the indirect method, may therefore be obtained by multiplying the State SMR by the total United States rate. In this sense, then, although strictly speaking the SMR is a ratio and not a rate, it may be interpreted numerically as a standardized rate that is expressed as a percent of the total United States rate.

The population and the number of deaths in the various race, sex, and residence categories are given in table 1. Even with a 2-year experience, substantial numbers of deaths for rate computations are available only for the white population, both urban and rural, and for the nonwhite urban male population.

Geographic Distribution, 1948–49

In table 2 are given the age, race, and sex specific rates for residents of urban and rural areas of the entire United States. It is observed that, with the broad definition of urban used here, the mortality recorded is substantially greater for urban than for rural residents in all race and sex groups. The excess urban rate is more pronounced among males than among females, however. These differences are in general conformity with those recorded for white persons in England (*3*), Denmark (*4*), and Norway (*5*). It is not possible with data presently available here or elsewhere to determine whether they are due to occupational, environmental, economic, diagnostic, or other factors, although there has been considerable speculation regarding reasons for such differences.

It is also observed in table 2 that in each sex and residence category the total rates for the white population exceed those recorded for the nonwhite. The difference in rates between the race groups is more pronounced, however, among males than among females.

In connection with the difference in rates for the two race groups, comparisons of age

Table 1. Urban and rural population (1950) and deaths from cancer of the lung (1948–49) in the United States, according to race and sex

Race and sex	Urban		Rural		United States	
	Population	Deaths	Population	Deaths	Population	Deaths
White:						
Male	38, 697, 282	18, 201	28, 431, 910	6, 711	67, 129, 192	24, 912
Female	40, 970, 582	4, 358	26, 842, 254	1, 888	69, 812, 836	6, 246
Nonwhite:						
Male	4, 419, 988	1, 244	3, 284, 059	354	7, 704, 047	1, 598
Female	4, 839, 612	326	3, 211, 674	98	8, 051, 286	424
Total	88, 927, 464	24, 129	61, 769, 897	9, 051	150, 697, 361	33, 180

specific rates are of considerable interest. In the urban population, age specific death rates for the nonwhite group exceed or approximately equal the rates for the white group up to age 55 years among males and up to age 60 years among females. Among older persons, rates for the white population greatly exceed the rates for the nonwhite. This tendency is also evident, although less pronounced, in the rural population. It is therefore clear that the greater overall mortality in the white population is due to excessive rates for older persons. No reason

Table 2. Average annual age, race, and sex specific mortality rates per 1,000,000 population for cancer of the lung among the urban and rural population of the United States, 1948–49 [1]

Age (years)	Urban [2]				Rural			
	White		Nonwhite		White		Nonwhite	
	Male	Female	Male	Female	Male	Female	Male	Female
Total crude rate	235. 2	53. 2	140. 7	33. 7	118. 0	35. 2	53. 9	15. 3
Total adjusted rate [3]	223. 4	47. 4	169. 1	41. 6	123. 23	36. 8	73. 2	21. 4
0–29	2. 6	1. 6	3. 9	1. 2	2. 1	1. 3	2. 2	0. 5
30–34	16. 8	7. 9	29. 0	8. 2	10. 5	4. 7	19. 2	5. 3
35–39	46. 0	17. 6	55. 3	25. 6	34. 6	9. 1	26. 2	5. 1
40–44	111. 7	28. 0	146. 4	47. 0	66. 4	20. 1	53. 3	30. 2
45–49	274. 8	54. 8	265. 3	68. 4	158. 1	42. 4	108. 4	54. 0
50–54	502. 8	81. 2	495. 6	119. 4	302. 3	59. 6	212. 6	27. 9
55–59	819. 5	126. 0	709. 3	123. 7	453. 4	92. 0	317. 3	79. 4
60–64	1, 053. 1	172. 7	761. 8	153. 8	560. 6	141. 4	311. 6	60. 1
65–69	1, 109. 5	228. 2	586. 6	142. 7	556. 7	185. 1	270. 8	89. 2
70–74	1, 104. 6	279. 4	476. 0	135. 9	570. 2	225. 3	158. 7	133. 7
75 and over	867. 9	319. 0	501. 6	181. 6	488. 9	260. 1	255. 0	52. 6
0–44	20. 1	6. 9	26. 2	9. 1	11. 6	4. 0	8. 5	3. 1
45–64	622. 9	102. 7	497. 8	106. 6	348. 7	78. 7	220. 6	53. 1
65 and over	1, 037. 5	272. 3	535. 8	151. 5	539. 0	221. 2	236. 4	89. 6

Age (years)	Total				
	White		Nonwhite		All persons
	Male	Female	Male	Female	
Total crude rate	185. 6	46. 0	103. 7	26. 3	110. 1
Total adjusted rate [3]	183. 1	43. 6	130. 6	34. 1	110. 1
0–29	2. 3	1. 5	3. 1	0. 9	1. 9
30–34	14. 3	6. 7	25. 7	7. 3	11. 0
35–39	41. 4	14. 4	45. 4	19. 2	28. 1
40–44	93. 7	25. 1	114. 8	41. 6	61. 0
45–49	229. 5	50. 4	211. 8	63. 8	139. 6
50–54	427. 0	73. 7	397. 3	87. 9	249. 3
55–59	679. 7	114. 0	558. 8	107. 6	392. 9
60–64	861. 3	161. 7	578. 1	118. 4	501. 3
65–69	881. 9	212. 9	439. 1	120. 5	515. 3
70–74	874. 6	260. 2	320. 3	135. 0	530. 5
75 and over	698. 0	297. 8	372. 2	124. 5	462. 9
0–44	16. 4	5. 7	18. 4	6. 6	11. 2
45–64	517. 6	94. 2	397. 3	88. 0	300. 6
65 and over	824. 1	254. 0	389. 3	125. 2	503. 1

[1] Deaths according to International List Nos. 47b, c, d, and e (1948) and Nos. 162 and 163 (1949); population according to 1950 census. [2] Urban population is generally that living in places of 2,500 and over. [3] Adjusted to the age distribution of the total United States population at the 1950 census.

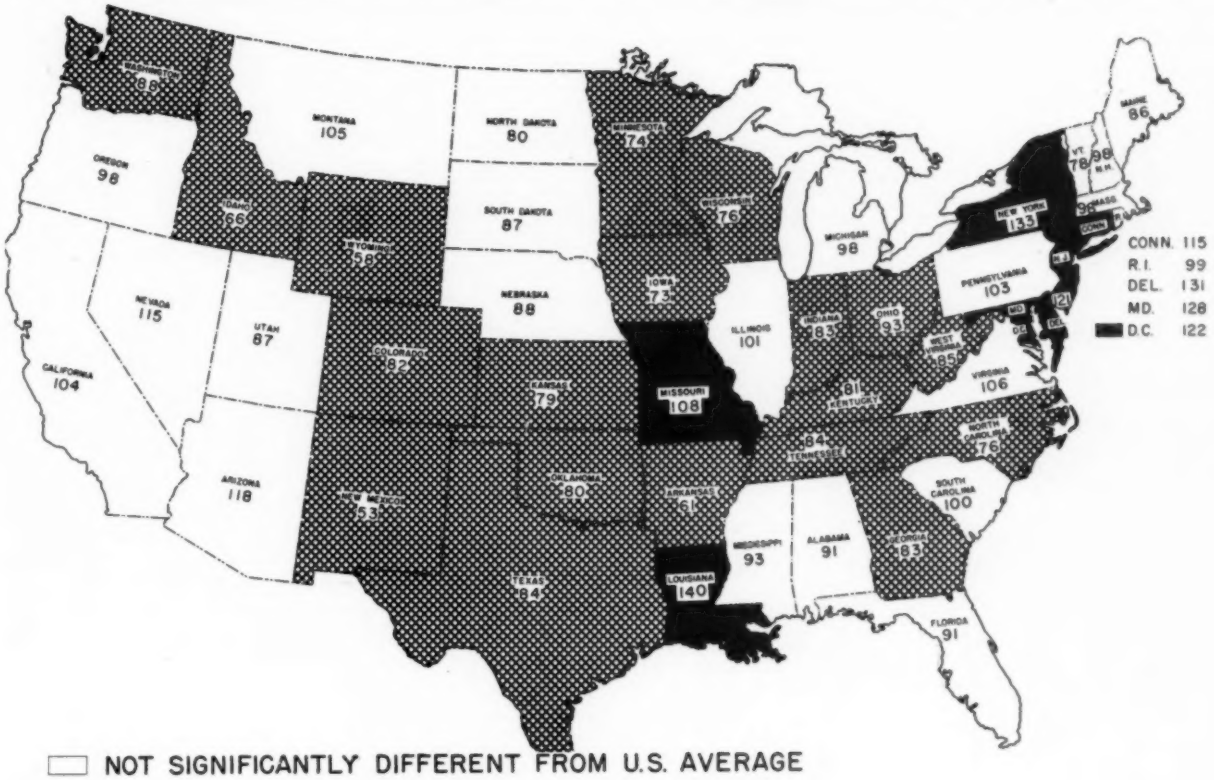
Table 3. Cancer of the lung: standardized mortality ratios for the States and regions of the United States, compared with crude mortality ratios, 1948–49

Region and State	Number deaths		Standardized mortality ratio (SMR) [1]	Crude mortality ratio (CMR)	Ratio: SMR / CMR
	Observed	Expected			
United States	33, 180	33, 181	100	100	
New England	2, 448	2, 449	100	119	84
Maine	174	202	†86	86	100
New Hampshire	131	133	98	112	88
Vermont	63	81	†78	76	103
Massachusetts	1, 298	1, 326	98	126	78
Rhode Island	210	212	99	120	82
Connecticut	572	495	*115	129	89
Middle Atlantic	9, 423	7, 765	*121	142	85
New York	5, 331	4, 005	*133	163	82
New Jersey	1, 509	1, 251	*121	142	85
Pennsylvania	2, 583	2, 509	103	112	92
South Atlantic	3, 332	3, 430	97	71	137
Delaware	86	66	*131	123	106
Maryland	575	448	*128	111	115
District of Columbia	231	189	*122	131	93
Virginia	542	513	106	74	143
West Virginia	287	338	*85	65	131
North Carolina	400	526	*76	45	169
South Carolina	247	247	100	53	189
Georgia	412	496	*83	54	154
Florida	552	607	†91	90	101
East North Central	6, 851	7, 353	*93	102	91
Ohio	1, 800	1, 941	*93	103	90
Indiana	746	899	*83	86	96
Illinois	2, 284	2, 268	101	119	85
Michigan	1, 393	1, 422	98	99	99
Wisconsin	628	823	*76	83	92
West North Central	2, 864	3, 307	*87	92	94
Minnesota	524	711	*74	80	92
Iowa	459	627	*73	80	91
Missouri	1, 056	976	*108	121	89
North Dakota	90	113	†80	66	121
South Dakota	116	133	87	81	107
Nebraska	274	310	†88	94	94
Kansas	345	437	*79	82	96
East South Central	1, 553	1, 799	*86	61	141
Kentucky	425	524	*81	66	123
Tennessee	457	542	*84	63	133
Alabama	402	443	91	60	152
Mississippi	269	290	93	56	166
West South Central	2, 354	2, 619	*90	74	122
Arkansas	199	324	*61	47	130
Louisiana	603	430	*140	102	137
Oklahoma	364	454	*80	74	108
Texas	1, 188	1, 411	*84	70	120
Mountain	843	987	*85	75	113
Montana	140	134	105	108	97
Idaho	75	113	*66	58	114
Wyoming	33	57	*58	52	112
Colorado	246	299	*82	84	98
New Mexico	53	100	*53	35	151
Arizona	146	124	†118	88	134
Utah	108	124	87	71	122
Nevada	42	36	115	119	97
Pacific	3, 512	3, 472	101	110	92
Washington	494	563	*88	94	94
Oregon	350	358	98	104	94
California	2, 668	2, 551	†104	114	91

Key. *P=0.014 or less. †P=0.015 to 0.054.

[1] Apparent discrepancies in some SMR's are due to use of decimals in computations of expected deaths and of SMR and subsequent rounding of figures. A standardized total annual State rate per million population may be obtained by multiplying its SMR by the total United States rate, 110.1.

Standardized mortality ratios for cancer of the lung among the States of the United States, 1948–49.



for this age differential in rates is apparent. However, it justifies questioning the commonly held belief that the excessive total rate in the white population is due to difference in diagnostic facilities available to the two race groups. It seems unreasonable to believe such facilities would be equal for young adults and not for persons of older ages.

The SMR for each State, computed from the United States rates in table 2, is given in table 3. For comparison, the crude mortality ratio (CMR) is also given. The CMR represents the unadjusted crude State rate expressed as a percentage of the United States total rate. The SMR's are also presented on the accompanying map, and here the States with ratios significantly (at a P=0.01 or less) higher or lower than the United States average are indicated by shading. (P=probability that an equal or greater difference between the SMR and the United States average could arise from sampling errors.)

As shown in table 3 and in the map, 8 States and the District of Columbia had significantly higher ratios and 19 States significantly lower ratios. If a P=0.05 were considered significant—but this would appear to be a thin reed on which to lean with data such as these—2 additional States (Arizona and California) would have significantly higher ratios, and 5 additional States (Maine, Vermont, Florida, North Dakota, and Nebraska) would have significantly lower ratios. It should be noted that, although the heavily industrialized States of New York, Connecticut, New Jersey, and Delaware have ratios significantly higher than the United States average, relatively nonindustrial Louisiana has the highest ratio of all and nonindustrial District of Columbia also has a significantly higher ratio. Some other heavily industrialized States, such as Pennsylvania, Ohio, and Michigan, have either average or below average ratios.

The importance of standardization of rates

Table 4. Cancer of the lung, 1948–49: number of expected deaths and standardized mortality ratios for the race and residence components of each State's population [1]

Region and State	Urban				Rural			
	White		Nonwhite		White		Nonwhite	
	Expected deaths [2]	Standardized mortality ratio	Expected deaths [2]	Standardized mortality ratio	Expected deaths [2]	Standardized mortality ratio	Expected deaths [2]	Standardized mortality ratio
United States	22, 556	100	1, 568	100	8, 597	100	450	100
New England:								
Maine	108	*74	0. 2	448	94	99	0. 1	----------
New Hampshire	90	*74	. 1	----------	44	*145	. 03	----------
Vermont	39	69	. 1	----------	42	86	. 03	----------
Massachusetts	1, 212	95	14	119	100	*127	. 5	365
Rhode Island	196	94	2	159	13	*170	. 1	----------
Connecticut	365	98	7	94	122	*168	. 6	332
Middle Atlantic:								
New York	3, 352	*132	143	*138	505	*137	4	†222
New Jersey	1, 043	*114	45	112	158	*157	4	*338
Pennsylvania	1, 845	102	103	*130	556	101	5	*252
South Atlantic:								
Delaware	36	*144	5	44	23	121	2	228
Maryland	269	*126	42	*139	127	*126	10	*181
District of Columbia	144	*126	44	110	----------	----------	----------	----------
Virginia	230	110	52	110	201	98	31	117
West Virginia	156	*79	9	114	166	†84	6	*208
North Carolina	180	*79	52	*50	252	*78	40	85
South Carolina	83	110	28	75	102	102	34	89
Georgia	197	95	71	*48	189	90	38	*53
Florida	383	†90	61	†70	145	101	17	101
East North Central:								
Ohio	1, 416	*93	85	100	436	*88	4	†206
Indiana	572	*83	31	107	295	*80	1	----------
Illinois	1, 766	101	109	107	388	98	4	166
Michigan	1, 004	*90	63	111	351	*117	3	†235
Wisconsin	552	*74	4	67	265	*81	1	----------
West North Central:								
Minnesota	468	*72	4	†196	239	*75	1	----------
Iowa	371	*74	4	171	252	*71	. 2	----------
Missouri	609	105	53	*185	310	101	4	130

is emphasized in the comparison made in table 3 between the SMR's and the CMR's. Inspection of the ratio between them shows that in general standardization yields SMR's that are lower than the CMR's in the States with large urban and white populations and SMR's that are higher in the more rural States with a large nonwhite population. Unpublished analyses of the effect of different types of rate standardization indicate that in these data standardization for residence and race is more necessary than standardization for age.

The influence of the race and residence population components of each State on its SMR is shown in table 4. The SMR's in this table were computed for the urban and rural portions of the white and nonwhite populations of each State. Specifically, the number of expected deaths for the white urban population was computed by applying the age and sex specific rates for the urban population of the entire United States to the appropriate State population; the numbers of expected deaths for the other three population groups were similarly derived. (The sum of the expected deaths in the four categories of table 4 should equal the total number given for the expected deaths in each State, as given in table 3. That they do not exactly in each instance is due to use of decimals in computations and subsequent rounding of figures for the tables.)

Taking Louisiana as an example, in all 4 race and residence categories the ratio was greater than the United States average, and in 3 of the

Table 4. Cancer of the lung, 1948–49: number of expected deaths and standardized mortality ratios for the race and residence components of each State's population [1]—Continued

Region and State	Urban				Rural			
	White		Nonwhite		White		Nonwhite	
	Expected deaths [2]	Standardized mortality ratio	Expected deaths [2]	Standardized mortality ratio	Expected deaths [2]	Standardized mortality ratio	Expected deaths [2]	Standardized mortality ratio
West North Central—Con.								
North Dakota	42	†70	0.1	----------	70	84	0.6	†346
South Dakota	59	†71	.4	264	72	101	1	----------
Nebraska	174	†85	4	146	132	90	.3	334
Kansas	237	*82	13	129	184	*71	2	128
East South Central:								
Kentucky	226	*78	28	†139	262	*76	7	134
Tennessee	219	†85	62	*60	246	92	16	†44
Alabama	176	101	64	*42	165	104	39	†63
Mississippi	82	109	38	69	118	103	52	*59
West South Central:								
Arkansas	122	*56	28	*51	151	*72	23	*39
Louisiana	212	*132	72	115	113	*164	33	*168
Oklahoma	260	*81	19	*27	169	82	8	106
Texas	874	*79	101	81	402	94	32	98
Mountain:								
Montana	76	118	.5	*567	56	82	1	190
Idaho	60	*68	.4	----------	51	†66	.5	----------
Wyoming	36	†62	.4	----------	21	†52	.3	----------
Colorado	211	*80	4	23	83	93	.5	----------
New Mexico	59	*59	1	79	37	*46	2	----------
Arizona	66	†125	3	147	50	113	5	62
Utah	90	†78	1	228	32	111	.4	----------
Nevada	24	106	1	----------	12	146	.4	----------
Pacific:								
Washington	381	*82	8	78	173	100	1	138
Oregon	227	98	3	205	127	94	1	146
California	1,957	100	85	93	496	*122	13	150

Key: *P=0.014 or less. †P=0.015 to 0.054.

[1] Apparent discrepancies between this table and table 3 are due to use of decimals in computations and subsequent rounding of figures. [2] Deaths expected if appropriate age specific rates for the United States prevailed. When expected deaths are few, the value of P has little real meaning.

4 it was significantly greater. It is thus seen that the total SMR for Louisiana (140) is contributed to by all race and residence components of the population and is therefore not due alone to an excessive rate in its largest city, New Orleans. The excessive ratios in New York and Maryland are also contributed to by all race and residence components of their populations. In Connecticut, on the other hand, although the urban ratios for both race groups are not significantly different from the average, the excess among white rural residents is sufficiently great to make the total State ratio excessive. In California, although the ratio for the whole State is not significantly different from the United States average, the white rural population of the State has a significantly higher ratio than that of the white rural population of the entire United States. Similar effects are noted in some other States.

Table 4 also gives an indirect idea of the composition of each State population by race and residence since the deaths expected are directly related to the number of people in each component. It is obvious from table 4, for example, that there are few rural nonwhite residents in Maine, since only 0.1 of a death was expected among them.

Mortality Trend in the States

In table 5, the 1930–32 death rates for cancer of the lung and pleura recorded by Gover (*1*) are compared with the 1948–49 rates for

Table 5. Death rates per 100,000 population and relative increase in mortality from cancer of the lung among the States, 1930–32 and 1948–49 [1]

Region and State	Total			White			Nonwhite		
	Death rate [2]		Ratio: 1948–49 / 1930–32	Death rate [2]		Ratio: 1948–49 / 1930–32	Death rate [2]		Ratio: 1948–49 / 1930–32
	1930–32 [3]	1948–49		1930–32 [3]	1948–49		1930–32 [3]	1948–49	
United States	2. 39	8. 83	3. 69	2. 49	9. 01	3. 62	1. 10	6. 60	6. 00
New England:									
Maine	2. 51	6. 95	2. 77						
New Hampshire	2. 04	8. 62	4. 22						
Vermont	1. 72	5. 93	3. 45						
Massachusetts	2. 71	9. 70	3. 58						
Rhode Island	3. 33	10. 19	3. 06						
Connecticut	2. 93	10. 58	3. 61						
Middle Atlantic:									
New York	4. 41	12. 97	2. 94						
New Jersey	3. 33	11. 68	3. 51						
Pennsylvania	2. 42	9. 61	3. 97						
South Atlantic:									
Delaware	2. 44	10. 66	4. 37						
Maryland	3. 00	10. 66	3. 55	3. 15	10. 64	3. 38	1. 88	10. 20	5. 42
District of Columbia	3. 45	11. 89	3. 45	3. 71	12. 90	3. 48	2. 56	9. 24	3. 61
Virginia	1. 63	7. 86	4. 82	1. 76	8. 16	4. 64	1. 21	6. 60	5. 45
West Virginia	1. 11	6. 77	6. 10						
North Carolina	1. 33	5. 23	3. 93	1. 52	5. 76	3. 80	. 76	3. 47	4. 56
South Carolina	1. 01	6. 50	6. 44	1. 44	7. 86	5. 46	. 37	3. 88	10. 49
Georgia	. 79	5. 96	7. 54	. 97	7. 18	7. 40	. 42	2. 89	6. 88
Florida	1. 80	7. 95	4. 42	2. 19	8. 49	3. 88	. 33	5. 15	15. 61
East North Central:									
Ohio	2. 12	8. 68	4. 09						
Indiana	1. 56	7. 30	4. 68						
Illinois	2. 77	9. 73	3. 51						
Michigan	2. 08	9. 10	4. 38						
Wisconsin	2. 32	6. 80	2. 93						
West North Central:									
Minnesota	2. 60	6. 48	2. 49						
Iowa	1. 82	6. 13	3. 37						
Missouri	2. 23	9. 59	4. 30						

the total population in each State. In addition, the 1930–32 rates for the white and nonwhite populations in the 15 States for which these rates were available are compared with the 1948–49 rates. In these 15 States, the nonwhite population was at least 10,000 or constituted 10 percent or more of the total population. Rates for both periods are standardized to the age distribution of the United States population in 1930.

Attention should be called to the fact that the rates in table 5 do not permit valid rank-order comparisons between States for either the earlier or later period, since basic data were not available to adjust Gover's data for residence (urban-rural). Thus, the rate in New York for 1948–49 is given in table 5 as 12.97 and that for Louisiana as 10.63, although it has already been shown, in table 3, that the risk of death in Louisiana is numerically greater than in New York when account is taken of the urban-rural influence. The figures in table 5 do, however, permit comparisons among the States in relative increases between the two periods.

Between 1930–32 and 1948–49 mortality attributed to cancer of the lung increased nearly 4 times in the entire United States. The rate for the nonwhite population increased 6 times while the rate for the white population increased only about 4 times. This greater relative increase among the nonwhite population may be due in part to a greater relative increase in urbanization and its concomitants among the nonwhite. Between 1930 and 1950, the percent of the nonwhite population classed as urban

Table 5. Death rates per 100,000 population and relative increase in mortality from cancer of the lung among the States, 1930–32 and 1948–49 [1]—Continued

Region and State	Total			White			Nonwhite		
	Death rate [2]		Ratio: 1948–49 / 1930–32	Death rate [2]		Ratio: 1948–49 / 1930–32	Death rate [2]		Ratio: 1948–49 / 1930–32
	1930–32 [3]	1948–49		1930–32 [3]	1948–49		1930–32 [3]	1948–49	
West North Central—Con.									
North Dakota	1. 89	6. 07	3. 21						
South Dakota	2. 37	6. 88	2. 90						
Nebraska	1. 99	7. 44	3. 74						
Kansas	1. 25	6. 52	5. 22						
East South Central:									
Kentucky	. 97	6. 28	6. 47	. 99	5. 97	6. 03	. 85	9. 88	11. 62
Tennessee	1. 12	6. 36	5. 68	1. 16	6. 87	5. 92	. 92	3. 85	4. 18
Alabama	1. 16	6. 44	5. 55	1. 48	8. 05	5. 44	. 54	2. 74	5. 07
Mississippi	. 74	5. 90	7. 97	1. 17	7. 96	6. 80	. 23	3. 03	13. 17
West South Central:									
Arkansas	. 77	4. 58	5. 95	. 94	5. 18	5. 51	. 19	2. 40	12. 63
Louisiana	2. 31	10. 63	4. 60	2. 82	11. 99	4. 25	1. 29	7. 72	5. 98
Oklahoma	. 95	6. 55	6. 89	1. 03	6. 86	6. 66	. 15	3. 09	20. 60
Texas [4]		7. 02			7. 22			5. 52	
Mountain:									
Montana	1. 82	9. 01	4. 95						
Idaho	1. 63	5. 64	3. 46						
Wyoming	1. 39	5. 23	3. 76						
Colorado	3. 02	7. 34	2. 43						
New Mexico	1. 15	4. 42	3. 84						
Arizona	2. 68	9. 49	3. 54						
Utah	2. 64	7. 69	2. 91						
Nevada	1. 86	10. 73	5. 77						
Pacific:									
Washington	2. 21	7. 80	3. 53						
Oregon	2. 20	8. 60	3. 91						
California	2. 96	9. 70	3. 28	2. 93	9. 77	3. 33	3. 65	8. 02	2. 20

[1] Since the rates in this table are not adjusted for residence (urban-rural), rank-order comparisons between States are not valid. Only comparisons between the States in relative increases from 1930–32 to 1948–49 can be made with these rates. [2] Rates for both periods are standardized for age to the 1930 census population of the entire United States. [3] Rates are from Gover (*1*). [4] Texas did not enter the death registration area until 1933.

increased from 43 to 59 percent, whereas in the white population the increase was only from 56 to 59 percent. It cannot be determined from these data how much of this difference in increase in rates may be attributed to differences in increase in urbanization and its concomitants.

The increase in rates varied from a low of about 2 times in Colorado to a high of about 8 times in Mississippi. Although the calculations are not given, it has been shown that there is a good negative correlation between the 1930–32 State rates and the relative increase. That is, the States with low rates in the earlier period tended to exhibit a greater relative increase than those with higher rates. There is no similar correlation between the 1948–49 rates and relative increase in rates.

These data do not permit any guess as to how much of the State differences in relative increase might be due to differences in increase in urbanization.

Summary

Age, race, sex, and residence (urban-rural) specific rates for mortality attributed to cancer of the lung are given for the United States for an average of the years 1948–49. In all age, race, and sex components, the rate is greater for urban residents than for rural residents. The total rates for the white population are considerably higher than those for the nonwhite, but the difference is more pronounced among males than among females. The overall excess among the white population is due to greatly excessive rates among older persons, since in some of the younger age groups rates are actually higher among the nonwhite population. This age dif-

ferential in rates does not appear to be consistent with the view that the lower total mortality for the nonwhite population is due to inadequate diagnostic facilities.

State rates in 1948–49 are compared by means of standardized mortality ratios. These are ratios standardized for age, race, sex, and residence (urban-rural) and expressed as a percentage of the United States total rate. The influence of the residence and race components of each State population on its total ratio is also demonstrated. It is not possible from data now available here or elsewhere to determine whether the observed geographic distribution is due to environmental, occupational, economic, diagnostic, or other factors.

The increase in lung cancer mortality between 1930–32 and 1948–49 is also shown for the United States and for each State. The increase among the nonwhite population was greater than in the white, but this may be due largely to a greater relative increase in urbanization and its concomitants among the nonwhite population during this period.

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Ask Information on Employee Health Services

The Occupational Health Branch of the Public Health Service urgently needs information on health maintenance services provided workers in small plants at or through their places of employment. This information will aid in developing methods for bringing such services to small establishments.

Management now provides employees of many large industrial organizations with such health services as care of occupational diseases and injuries, health counseling, and periodic health examinations. Regular professional health services of this type, usually given within the plants, are separate and distinct from other management sponsored health activities such as medical insurance plans and medical services given on an on-call-for-emergency basis.

In industrial, commercial, and agricultural establishments of less than 1,000 employees, there is probably a greater coverage of workers than has been publicized. The names and locations of currently operating programs designed for these employees are welcomed. Information is to be sent to: Division of Special Health Services, Occupational Health Branch, Public Health Service, Washington 25, D. C.

Some Thoughts on Cancer Research

By R. KEITH CANNAN, D.Sc.

THE OBJECTIVE of cancer research is the control of cancer in man. This statement would appear to be so obvious as to require no elaboration. The inquiring layman, however, who surveys contemporary programs of research sponsored by agencies interested in the control of cancer may well find occasion to pause. He will observe that a large proportion of the work currently in progress is being conducted in laboratories rather than at the bedside, and he will note also that much of it is concerned with problems that seem to bear no apparent relation to human cancer. He may well wonder whether investigators are losing sight of the medical woods in their zest for climbing their own particular scientific trees.

Why is cancer research diffused so widely over the face of medical science, and why is much of it so remotely related to the cancer patient? The question is a pertinent one and merits thoughtful answer.

In this matter, as in most critical appraisals, it is well to begin by laying down some basic propositions. Two will suffice for the argument that follows.

Dr. Cannan is chairman of the Division of Medical Sciences, National Research Council. *His discussion of cancer research was prepared at the suggestion of the National Cancer Institute, Public Health Service, and is based on his testimony at the health inquiry hearing of the Committee on Interstate and Foreign Commerce, House of Representatives, October 2, 1953.*

The first proposition is that cancer is a disease of individual cells. The weight of evidence forces the conclusion that a tumor is merely the visible sign of the presence in a tissue of colonies of aberrant cells that have broken through the normal restraints on cell growth and are multiplying without regard to the health of the tissue from which they came or the economy of the organism as a whole. They are, however, not merely normal cells "on the loose." They are specifically and irreversibly modified cells. They are disordered rather than disorderly. This conclusion is implicit in the fact that their abnormal characteristics are such an intimate part of the cells that they are passed on to their progeny in the course of cell division. Cancer is a self-multiplying disorder of cells and therein lies its malignancy.

The second proposition is that the living cell is a chemical machine. A cell is recognized microscopically by its characteristic structure, but it is much more than an inert structure. It is a process. A living cell is a "becoming" rather than a "being." It lives by reason of a constant flux of chemical change whereby energy is mobilized for growth and multiplication and for the contribution of the individual cell to the activities of the organism as a whole. The structure of a cell, like that of an inanimate machine, is simply an organization of parts adapted to the purpose of converting energy into specific processes in an orderly and efficient manner. Each type of cell has its own peculiar structure designed to effect its own particular processes. Each type of cell has its own pattern of chemical activity. Change in structure or

change in physiological function is a reflection of some basic change in this complex of chemical reactions. In the last analysis the understanding and control of cellular activity is a biochemical problem.

A Biochemical Problem

If these two propositions are accepted, it follows that a malignant cell must differ chemically from a normal cell because it behaves differently. Since it continues to multiply under conditions in which its neighbors have ceased to do so, the cancer cell must be pursuing a pattern of chemical behavior different from that of the community of normal cells. If this is so, then the chief hope for the control of malignant growths that are beyond the reach of the surgeon's knife or the X-ray beam is the control of their chemical reactions.

Ten or fifteen years ago this conclusion would have been an affirmation of faith without proof because so little was known of the intimate chain of chemical events within the cell. Today, it may be asserted with some confidence that there is accumulating evidence that malignant cells do differ chemically from normal cells. This information has not yet provided us with a workable formula for controlling the growth of cancers, but it does justify the hope that chemical means to do so will be found.

The emphasis which has been placed on the biochemical approach to cancer does not detract in any degree from the importance of biological studies that do not involve chemical techniques. The relation of hereditary factors to cancer, the transplantability of cancers, the transmission of tumors by viruslike agents, the growth of cancer cells in tissue culture, the influence of hormones on susceptibility to the growth of tumors, the attempts to develop antibodies to malignant cells—all these and many other types of study are essential contributions. Without them the biochemist would have nothing to investigate. In the final issue, however, cancer is a biochemical problem, and the ultimate objective of those who are pursuing the biological avenues of approach indicated above must be to find chemical descriptions for the phenomena that they observe.

Obligations of Medicine

Medicine recognizes two major obligations. The first is the diagnosis and cure of disease as and where it is encountered. A more far-reaching obligation, however, is the prevention of disease by the disclosure and control of its causes. Much of the contemporary research in the field of cancer appears to be directed toward the search for the causes of malignant growth rather than toward the refinement of the therapeutic measures that offer the greatest immediate promise. There has been some criticism of this distribution of effort, but the criticism ignores the fact that the two approaches are not competitive but complementary. The worker in the laboratory is constantly developing new ideas, devising new tools, and exploring new concepts, which he refines and passes on to the clinical investigator. The clinical investigator, as constantly, is testing these ideas and applying these tools in the clinic and is passing back new questions, thereby channeling the work in the laboratory. A remarkable aspect of clinical investigation today is the speed with which new knowledge, garnered in the laboratory, receives clinical appraisal. In point of fact the seekers after causes and the seekers for diagnostic tests and therapeutic measures may pose their questions differently, but they find themselves exploring the same ground—the ground of the biochemistry of the cell. It is quite probable that the next major advance in chemotherapy may arise from some observation made in the course of an academic study of the cause of a particular animal tumor. It is also possible that the next new idea about the causes of malignant growth may emerge from clinical studies at the bedside or in the field.

Known Causes

A few extraneous causes of human cancer are known. They include several types of radiation and a heterogenous group of chemicals comprising the salts of a few metals, certain curious hydrocarbons, some tars, and a few intermediates in the manufacture of dyes. This is a motley assembly. These agents are known to interfere in one way or another with the chemistry of cells, but their chemical effects

exhibit no common characteristic which would explain their unique property of promoting cancerous growth.

To what extent human cancer is caused by exposure to environmental cancerogens is uncertain. Those enumerated above are relatively minor causes. On the other hand, the alarming increase in lung cancer in males during the past three decades has alerted medicine to the fact that civilized man is increasingly surrounding himself with an unnatural chemical environment whose cancerogenic potentialities have not been explored. Intensive studies of the possible relation of the incidence of particular types of cancer to exposure to chemical contaminants by contact, inhalation, or ingestion are badly needed.

Susceptibility

Although the known environmental cancerogens are of clinical importance only with respect to limited groups of people who may be subject to undue exposure to one or another of these agents, they have proved to be immensely valuable tools in the laboratory because they make possible controlled studies of the early and late stages in the progress of malignant growth. Such studies have established the fact that the development of a tumor depends not only on the presence of an inciter but also on the susceptibility of the exposed cells. There are wide differences in sensitivity to a particular cancerogen of the various types of cell in a single animal and also of a single type of cell in different species and, even, in different strains of the same species. To add to the confusion the relative susceptibilities of particular cell types to a series of cancerogens are quite variable. Such observations, coupled with the knowledge of the wide differences in the natural histories of the many types of human tumors lead to the inescapable conclusion that cancer is not one but many diseases and can have many causes.

It must be acknowledged that the term "susceptibility" is a cloak for ignorance. In part it represents the inherent resistance of the cell to the action of the inciter and, in part, the extent to which the body as a whole is able to restrain the tendency toward disordered growth that is presumably invoked by the inciter in susceptible cells. The hormones, and possibly other regulatory mechanisms of the body, are involved in the execution of these restraints. Whatever may be the complex of processes that determine the susceptibility of a cell to a particular inciter, the processes must be chemical in nature because the cell is a chemical machine.

Insofar as human cancer cannot be shown to be environmental in origin, the investigator must look within the body for its causes. In this difficult quest there are few leads. One can only surmise that there must arise in the body of the host some cancerogenic agent which evokes malignant changes in susceptible cells. This inciter may be a product of some chronic disorder of metabolism, some spontaneous distortion of the chemical mechanisms of heredity, or, possibly, an ill-defined agent comparable to the viruslike bodies that are known to be associated with certain animal tumors.

The argument that has been developed above reduces to the simple statement that the goal of the seeker after causes is the disclosure of chemical anomalies antecedent to the overt development of malignant cells. As and when these are uncovered, it will be possible to develop rational approaches to their therapeutic correction or control. In the meantime, attempts to improve present methods of diagnosis and treatment cannot be neglected. The best must not be allowed to be the enemy of the good.

Present Hope

Cancer can be cured if it is localized and accessible to the surgeon or the radiologist. The urgent challenge of cancer is the detection and control of hidden and diffuse malignancies. Present hope lies in chemotherapy. Chemical agents must be sought which will be carried in the blood stream to the cancer cells and will destroy them or inhibit their growth without disrupting the essential functions of normal tissues.

Faced with millions of available compounds, the investigator will not attempt to proceed on any hit-or-miss basis. He seeks out differences in the chemistry of normal and malignant cells

in the hope of identifying cellular reactions which are more sensitive to chemical interference in cancer cells than in normal cells. At present the direction taken in most chemotherapeutic studies stems from the argument that, because malignant cells multiply rapidly, the synthetic reactions associated with cell division are the most promising targets. On this basis it is possible to make a rational approach by selecting as potential interfering compounds a restricted group of chemicals that may be expected to interact with the cell constituents whose synthesis seems to control the division of the cell.

Even so the problem is proving to be highly complex. Each type of tumor in animals shows its own range of sensitivities to a series of drugs. Moreover, the same type of cancer in different species varies in its sensitivity to a particular chemotherapeutic agent. Evidently, each type of tumor in man must be investigated as a separate therapeutic problem. It is unlikely that a single miracle drug will be found that will control all of the major cancers that afflict mankind. On the other hand it becomes increasingly probable that medicine will develop a battery of drugs each of which will have therapeutic value under limited conditions.

In the control of human cancer much emphasis has been placed on the value of early diagnosis. Here, again, it is the buried and diffuse tumor that is the urgent problem. The hope is that the chemical disturbances that are presumed to be associated with the precancerous or early cancerous states are reflected in chemical changes in the body fluids and that means of identifying the latter can be devised. As in the case of chemotherapeutic agents it is unlikely that a single test will betray all types of cancer, but there is reason to hope that a series of tests of limited specificity will be evolved.

Conclusions

In conclusion, one may properly ask the question why the intensive study of the chemistry of cancer has been so long delayed. The answer can only be that the solution of a scientific problem requires tools appropriate for the task. With respect to the biochemistry of cancer, progress waited upon the development of instruments and techniques sensitive and gentle enough to probe the chemical activities of small groups of cells while they are alive and functional. These are now at hand. Specifically, the emergence of radioactive isotopes as molecular tracers has been the master key that is unlocking the doors of the biochemistry of the cell.

Notable advances have been made during the past decade in all avenues of cancer research. However, the most promising aspect of the contemporary scene is not the accumulation of isolated pieces of information but the fact that the many avenues to knowledge are rapidly drawing together and finding common ground in biochemistry. The biochemist and the biophysicist have now refined their techniques to the point that they are ready to join hands with the clinician, the geneticist, the cytologist, the microbiologist, and the endocrinologist. When scientists using different vocabularies reach common ground and learn to employ the same language, a notable intellectual synthesis has been achieved.

It may be well to emphasize that the timing of this larger synthesis was not at the command of investigators within the field of cancer studies. Its emergence depended upon developments in all the sciences ancillary to medicine. The future of cancer research does not lie in the hands of any group of the elect. It is determined by the progress of science as a whole. Herein lies a moral for those who administer the affairs of medical research. To attempt to encourage the study of single diseases as phenomena isolated from the main stream of medical and biological knowledge is the surest way to impede progress.

Local Health Organization

—A Progress Report—

By JACK C. HALDEMAN, M.D.

IN the 46 years since the first county health department was organized, the local health unit idea has spread, and today 2,197 counties are served by 1,365 full-time health units—county, city, local district, or State district organizations (*1*). Figure 1 shows this coverage by type of department as of June 1953.

The growth of local units did not occur at a steady rate, but fluctuated widely over the years and in different sections of the country. The idea was slow to take hold at first. Then came periods of rapid acceleration interspersed with periods of slow expansion or even contraction. Recently there has been a sharp decline in the rate of expansion. During the past 5 years there has been a net increase of only 46 units.

It is appropriate, therefore, to take stock at this time of the progress achieved in building local health services and to survey the problems still to be met in extending services to additional areas.

Measuring Growth of Local Services

The growth of local health services can be measured in a number of ways in addition to geographic coverage. Staffing and financing patterns are more accurate indexes of the intensity of services, and program expansion can indicate whether health departments are adapting their services to meet present-day needs.

Although the number of persons employed in State and local health agencies has increased considerably since the end of World War II (fig. 2), this growth has been uneven, both geographically and on the basis of the professional categories in which the increases have occurred. For local health department personnel, 40 percent of the overall increase between 1947 and 1952 was reported by 3 States. A State-by-State analysis reveals increases ranging from less than 3 percent in 1 State to 100 percent or more in 4 States. Decreases ranging from less than 1 percent to almost 25 percent were reported in 6 States.

Variations in the growth of professional staffs are also great with respect to categories of personnel. While the increase in the number of physicians in local health agencies amounted to only 4.5 percent, other professional groups increased markedly. For example, the number of dentists increased by 68.7 percent; health educators, 51.9 percent; engineers, 64.6 percent; and nutritionists, 90.7 percent. Comparable figures for medical and psychiatric social workers are not available for the 1947–52 period; however, their numbers increased by 270 percent between 1948 and 1952.

Staff Shortages and Expenditures

Despite the general improvement in the number of personnel employed, there are serious shortages to be considered. Of the 1,365 health

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organizations, 380 reported that the position of health officer was vacant or being temporarily filled on a part-time basis. A recent study (*2*) showed that about 10 percent of the budgeted positions in local health departments were vacant. Analysis of the number of additional personnel needed to staff existing organizations with the minimum personnel recognized as being essential may point up the situation more effectively. Of the more than 1,200 organizations reporting to the Public Health Service (*3*), 670 units need a total of 1,216 physicians in order to reach a minimum standard of 1 physician for every 50,000 persons—an essential according to pooled professional judgment—or 1 for every local health unit, whichever is less. More than 11,600 nurses are needed by 1,189 of these health units in order to reach the standard of 1 nurse per 5,000 population; and an additional 2,000 sanitarians and other sanitation personnel are needed by 736 organizations to attain the standard of 1 per 15,000 population.

It should be emphasized that these figures do not express total needs even for those organizations included in the count. These standards reflect what is considered to be the minimum staff needed for providing the more or less traditional services which any health department should supply. Any enrichment of program to meet the newer health problems would require either additional staff or a realinement of duties of present staff in these categories. Services of a variety of other professional groups would also be required to supplement those of the basic staff.

Measures of growth based on expenditures are likely to be misleading because of the changes in the value of the dollar. In addition, there have been varying estimates of the amount of money which will provide adequate public health services at any particular time. The amounts spent by local health departments are, on the average, below the lowest of the present estimates. The expenditures of local health departments as reported to the Public Health Service totaled approximately $150 million in 1952. This equals less than $1.00 per person in the United States as a whole, and about $1.10 per person when only that part of the population living in areas served by full-time health units is considered.

The total expenditures for State and local health services vary from more than $3.00 per capita to less than $1.00. (These figures exclude the costs of construction and operation of hospitals.) The States with the lowest per capita incomes are spending a larger proportion of their available resources on health than are States with the highest per capita incomes. When the States are divided into quartiles according to per capita income, the lowest income group spends an average of $1.00 for every $1,000 of individual income paid within the State, while States in the highest income group average about 71 cents per $1,000 (fig. 3). Of the 5 States which rank highest according to the proportion of income spent for health services, 4—Georgia, Kentucky, Mississippi, and North Carolina—are among the States lowest in per capita income, ranking 42d, 43d, 49th, and 46th, respectively.

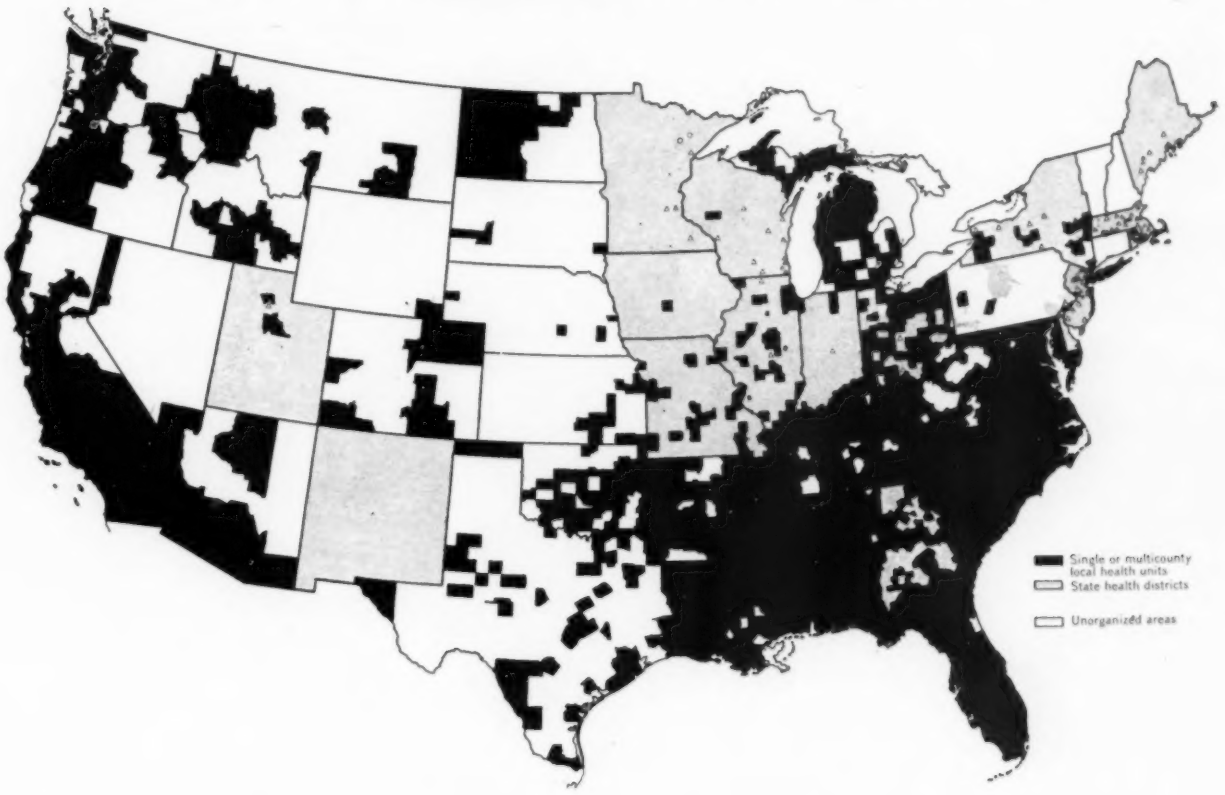
Distribution of Services

While the variety of health services being offered by health agencies of all types is steadily increasing, two facts are important in evaluating the change. First, these services are concentrated in cities. This is not unexpected since the facilities and professional skills needed for conducting such programs are largely concentrated in urban areas. For example, one-third of the jurisdictions reporting mental hygiene clinics were cities which comprise only about 16 percent of the total organizations reporting (*3*).

Second, these newer services have been developed to a large extent under the sponsorship of voluntary agencies. For example, about 60 percent of the cardiovascular clinics reported were operated by voluntary agencies, as were 53 percent of the diabetes clinics. In contrast, only about 7 percent of the tuberculosis clinics and 8 percent of the well-child conferences were operated by voluntary groups. These circumstances provide the health department with an opportunity to play a vital role in encouraging the coordination of the services of voluntary and official agencies.

It is clear that the problems facing the pub-

Figure 1. Areas reporting full-time local health service as of June 1953.



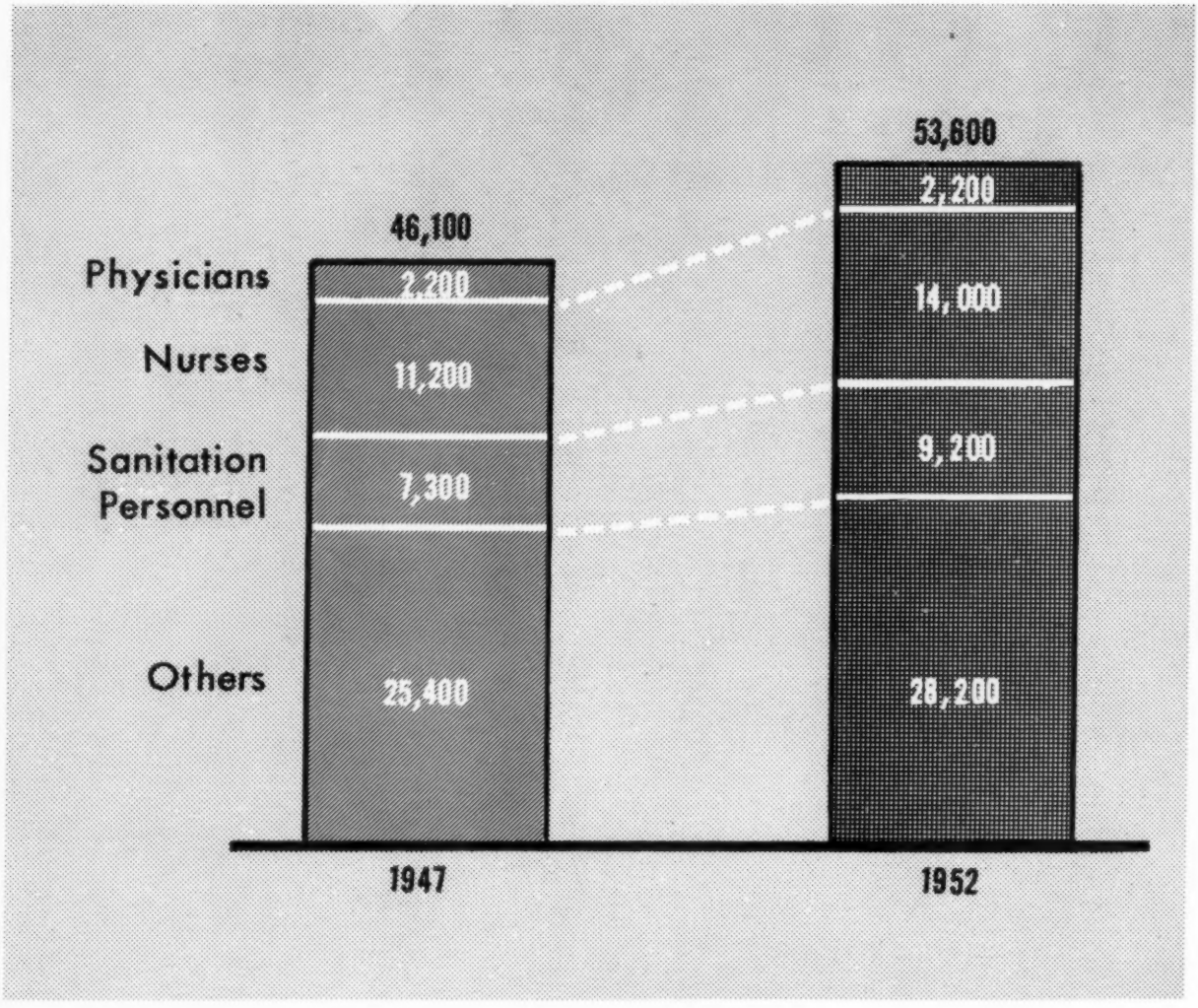
lic health administrator concerned with expansion and improvement of health services are manifold, and that new ideas and imaginative planning are necessary for their solution. A close look at the kinds of communities outside the existing local health organizations further supports the view that some change in thinking is desirable. Two-thirds of the counties without full-time official health services as defined earlier have populations under 15,000. Of the 14 States in which more than 25 percent of the population is in the unorganized areas, 6 have a population density of less than 10 persons per square mile. Only 2 counties have more than 100 persons per square mile. Within the sparsely populated States, most of the urbanized areas have some full-time health organization. Thus, the uncovered areas are generally those with a population density considerably less than that of the State as a whole. This fact points up the difficulty of applying the usual organizational pattern in these areas.

Health administrators in many parts of the country are devising methods for meeting some of these problems. New administrative arrangements for provision of health services are being worked out. Two States, for example, are developing plans whereby the local community may obtain services from the State health agency on a contract basis. In this way the sparsely settled community may procure the kinds and amount of services which it considers necessary. Such a procedure should prove more effective and economical than would an attempt to maintain a local health department of the traditional type. It is possible that availability of such services will stimulate community interest in providing additional services as the need for them is recognized. Other States are experimenting with strengthening and regionalizing their State consultant services in order to make technical assistance available to larger areas of the State.

Recruiting and Utilizing Personnel

The problem of the chronic shortage of professional personnel must be faced with the

Figure 2. Increase in public health workers, State and local health departments.

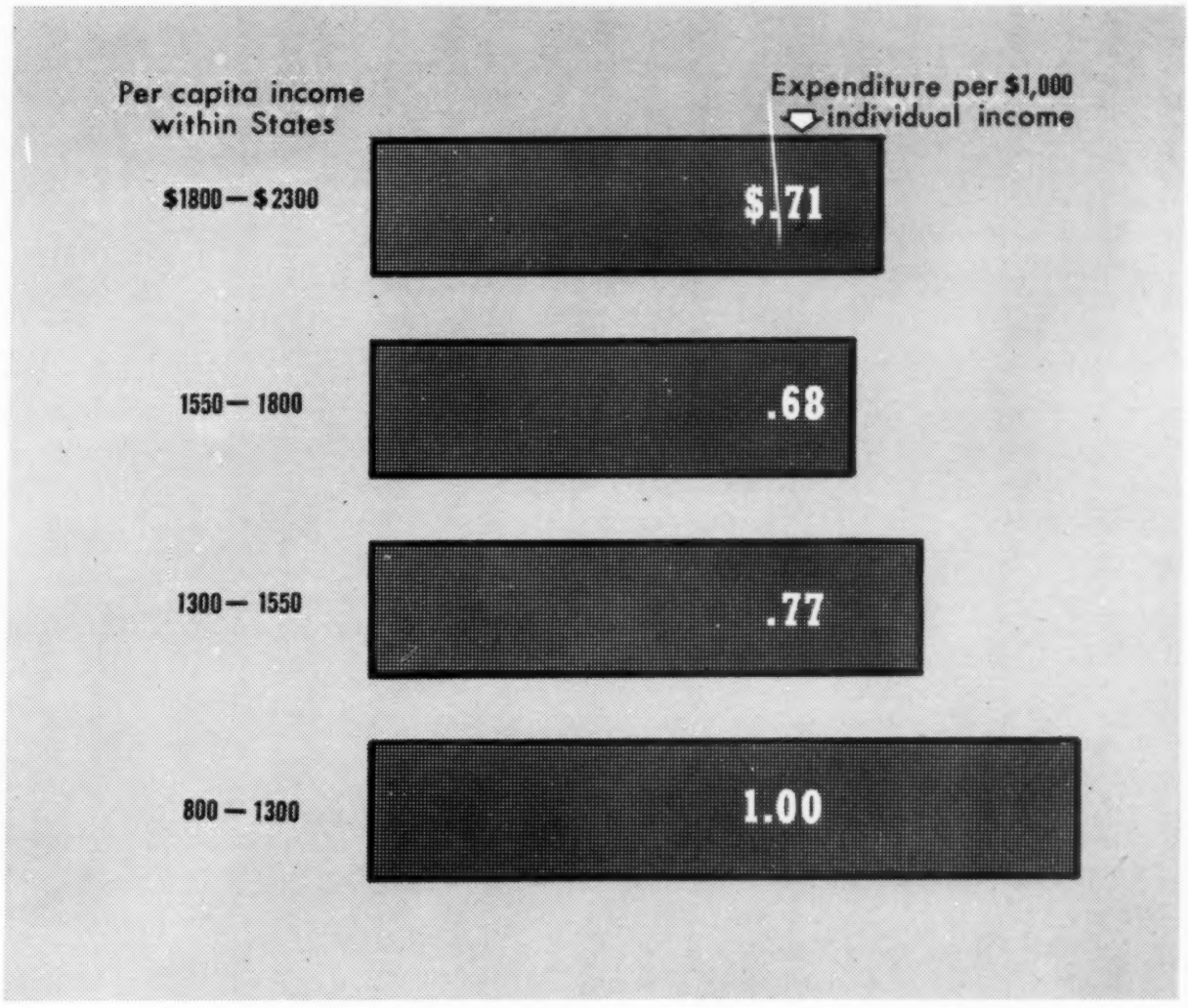


realization that there probably will not be enough personnel available to staff health departments in accordance with the accepted minimum standards. Professional schools at present are not supplying enough graduates to meet future military and civilian needs as they are now estimated (*4*). Active, imaginative recruiting will certainly help to attract desirable personnel if the challenge and personal satisfactions inherent in public health work are clearly shown. Financial rewards and opportunities for advancement, however, must be made commensurate with those of private employment if able, well-qualified persons are to be expected to remain in public service. Most important, perhaps, those who are already in the field must do the kind of job that makes public health a profession one would be proud to choose.

Here it may be well to reemphasize the fact that the professional knowledge and skills possessed by those already engaged in health work are not being fully used. A study made by the committee on professional education of the American Public Health Association (*5*) showed that many duties carried out in the past by professional personnel are being delegated to administrative personnel. However, there must be a continuing effort to relieve the professional staff of clerical and administrative duties which can be effectively performed by personnel with training in those fields.

In any plan for health services, it is imperative that full advantage be taken of all

Figure 3. State and local will to spend, in relation to financial capacity, 1952.



community resources for improvement of the public health. Part of the evolution of public health practice has taken place through the recognition of the increasing importance of the public health physician's function as a community leader and the corresponding decrease in his role as a law enforcement officer. Under such leadership the health department can act as a catalyst in bringing together the services of official and voluntary agencies for the improvement of the community health program. When the health department is able to fulfill this responsibility successfully, it may be possible to reduce the estimates of personnel needs and to extend a different sort of service to the "uncovered" areas.

The "health extension" concept of applying community organization techniques to the solution of health problems holds many possibilities. In a few places, individuals skilled in obtaining personal and community participation in public health plans and operation have worked through existing organizations and leaders to stimulate awareness of health problems. They have helped to discover and interpret the steps necessary to solve the problems, and have encouraged the needed individual and group action. Wider use of such techniques would undoubtedly strengthen the programs of local health units and help to increase the effectiveness of services available in areas without full-time health organizations.

Organizational Flexibility

A great deal has been written and spoken regarding the necessity for gearing health programs to the needs of individual communities. It is no less important to maintain the same flexibility in approaching matters of organization. For example, it is probable that not all communities will require the same pattern of organization which has been advocated in the past. It is also likely that the traditional lines of political jurisdictions may not be the best boundaries for health jurisdictions in some areas. In many cases, consolidation of existing health units will provide an organizational base broad enough to permit adequate financing. Combining the resources of several communities may also allow more flexibility in the utilization of professional personnel. Care must be exercised, however, to assure that the combination really achieves the intended purposes. Unless sufficient professional personnel—especially nurses and sanitarians—are available to staff the combined unit, the existing programs may be weakened rather than strengthened. This may happen where the geographic area is large and requires an excess of travel time for field personnel or for those expected to visit the health department clinics or offices.

Summary

Although progress in the development of local health services has been encouraging, there are still many areas where improvement is needed. Many local health organizations, as they are now constituted, cannot cope with today's health problems. This does not mean that local health departments are no longer desirable. It may mean that the present structure should be strengthened, that the organizational pattern of official health agencies should be substantially altered, or that services for the more complex public health problems should come from other sources. Certainly, any possibility of getting more or better services for less money than is now being expended should be continuously explored, and efforts to provide services for those communities presently lacking them should be intensified.

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An Evaluation of Tuberculosis Detection By Chest X-ray Surveys

By ROBERT J. ANDERSON, M.D., PHILIP E. ENTERLINE, M.A., FRANK J. HILL, M.D., and JEAN ROBERTS, M.P.H.

EACH YEAR over 13 million Americans receive chest X-ray examinations in a search for undetected tuberculosis. Implicit in the conduct of chest X-ray programs is the assumption that if tuberculosis were not so detected many cases would go on to a symptomatic and more advanced stage and diagnosis would be made at a time when a cure would be more difficult. No one has ever been able actually to test this assumption since no one knows what would have happened to a case if it had not been discovered by a survey.

In other words, there have been no controls. In this instance, controls would be a group of randomly selected persons participating in an X-ray program whose X-rays are positive for tuberculosis but who are not advised of the results of their X-rays and are allowed to go on their way, to be discovered by some other device—or possibly never to be detected. Since an intentional experiment of this nature is not acceptable within the framework of a tuberculosis control operation, we must seek other methods for evaluating the detection of tuberculosis by X-ray programs.

Although we cannot know with certainty what would have happened to survey-discovered tuberculosis cases if they had not been so discovered, we can readily study the outcome of cases detected by other means. A comparison of the course of disease in the two groups of cases is probably the most practical method of estimating the extent to which tuberculosis cases are benefited by discovery through chest X-ray surveys.

The present study is a report on the findings in a 4-year followup of cases of active tuberculosis discovered by a communitywide X-ray survey in Minneapolis, Minn., in 1947 (May 5–August 25) compared with the findings in a 4-year followup of active cases found in the same area by other means. Each case in both groups was followed for 4 years, or until death, or until lost to the study. In this study, an "active" case was defined as one having positive bacterial findings or X-ray changes characteristic of active tuberculosis. The data used were obtained from the files of the Minneapolis City Health Department.

The Minneapolis survey was one of the first communitywide chest X-ray surveys conducted

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in this country in a city of more than 100,000 population. Some of the results have already been reported (*1–3*). A total of 301,513 satisfactory examinations were made during a 3½-month period, 261,000 (estimated on the basis of a 10-percent sample of the survey records) on residents of the city of Minneapolis.

The Survey Group

Within a year after the close of the survey, 233 resident cases of active pulmonary tuberculosis had been identified as a result of the followup of patients with suspicious X-rays. However, 98 of these were excluded from the study for the following reasons: known as tuberculosis cases prior to the study, 34; initially diagnosed as having inactive tuberculosis, 59 (although later diagnosed as active, it was felt that followup results on these cases should not be compared with results on the nonsurvey cases, all of which were initially reported as active); identified as suspects by the X-ray program but not diagnosed until they died of tuberculosis, 2; eventually diagnosed as not having tuberculosis, 3. There were, then, 135 resident cases of pulmonary tuberculosis discovered in an active stage as a direct result of the communitywide chest X-ray survey.

The Nonsurvey Group

Cases discovered by means other than X-ray surveys included all resident active cases of tuberculosis reported to the Minneapolis City Health Department during the first 6 months of 1947. It would have been desirable for both groups of cases to have been reported during the same period, so that each group would have had the same advantages in terms of current techniques of treatment and followup procedures. However, it was felt that nonsurvey cases reported during the time of the survey might not be typical of nonsurvey cases usually reported, because a number of the survey cases would have been reported as the result of other case-finding procedures during or shortly after the survey had the survey not been conducted. A study of cases reported during the first 6 months of 1947 appeared to be the best compromise.

A total of 188 resident cases of active pulmonary tuberculosis was reported to the Minneapolis City Health Department during this 6-month period. In selecting a group from among these cases from which implications might be drawn as to what might have happened to survey cases had they not been detected in the survey, a number of eliminations had to be made.

Ideally, this group should consist of cases of tuberculosis that could have been discovered by a communitywide X-ray survey but were not because there was no survey activity, and thus they progressed to the point where they were found by other methods. Fifty-four cases were excluded from the study. Four were under 15 years of age, and the X-ray survey was restricted to persons 15 years of age and over; 5 were inmates of the State mental institution,

Table 1. Age and sex distribution of survey and nonsurvey cases

Age at time of report (in years)	Survey						Nonsurvey					
	Total		Male		Female		Total		Male		Female	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	135	100.0	90	100.0	45	100.0	134	100.0	87	100.0	47	100.0
15–34	31	23.0	16	17.8	15	33.3	43	32.1	19	21.8	24	51.1
35–54	50	37.0	36	40.0	14	31.1	37	27.6	27	31.0	10	21.3
55–74	50	37.0	34	37.8	16	35.6	42	31.4	32	36.8	10	21.3
75 and over	4	3.0	4	4.4	0	------	9	6.7	7	8.1	2	4.2
Unknown age	0	------	0	------	0	------	3	2.2	2	2.3	1	2.1

and the survey was not directed toward that group; 6 were eventually diagnosed as nontuberculous; 22 had been previously known as tuberculosis cases; and 17 were not reported until death. Although many of these 17 cases probably could have been discovered by an X-ray survey, they did not lend themselves to the type of analysis which follows. Their exclusion tends to minimize differences in the outcome of tuberculosis between the survey and the nonsurvey cases.

There remained, then, 134 resident active pulmonary cases of tuberculosis discovered by procedures other than the communitywide chest X-ray survey for comparison with 135 resident active pulmonary cases of tuberculosis discovered as a result of the survey.

Age and Sex Distribution

The age and sex distributions of the two groups of cases are shown in table 1. Males made up about two-thirds of each group. More nonsurvey than survey cases fell into the 15 to 34 and the 75-and-over age groups. The mean ages of males and females in the two groups were similar, however. In the survey group, the mean age of males was 50.9 years and in the nonsurvey group, 50.6 years, whereas the mean age for females was 44.4 years for the survey group and 39.5 years for the nonsurvey group. If there are large differences in the outcome of tuberculosis in these two groups of cases, they are probably not due to differences in age and sex composition.

Bacteriological Status

Ninety-two (68 percent) of the 135 survey cases had a positive bacteriological examination reported to the health department within 3 months of the case report compared with only 72 (54 percent) of the 134 nonsurvey cases. Apparently, the search for tubercle bacilli among survey cases was somewhat more thorough than among nonsurvey cases since 19 of the positive reports for survey cases were based upon examination of gastric contents compared with only 9 of the positive reports among nonsurvey cases. This may partly account for the fewer positive reports among the nonsurvey group, and it seems likely that the two groups of cases were comparable in terms of their clinical significance.

Stage of Disease

Shown in table 2 is the stage of disease of these two groups of cases at the time they were first reported. Of the survey cases, 37.0 percent were reported as minimal; only 21.7 percent of the nonsurvey cases were so reported. Conversely, only 15.6 percent of the survey cases were reported in the far advanced stage compared with 32.8 percent of the nonsurvey cases. This suggests that survey cases were discovered in a considerably earlier stage than they would have been had the chest X-ray survey not been conducted.

Table 2. Stage of disease at time of report

Stage of disease	Survey cases		Nonsurvey cases	
	Number	Percent	Number	Percent
Total	135	100.0	134	100.0
Minimal	50	37.0	29	21.7
Moderately advanced	64	47.4	61	45.5
Far advanced	21	15.6	44	32.8

Status at End of Followup

There was little apparent difference between the survey and nonsurvey cases in terms of the proportion discharged from health department supervision during the followup period and the reasons for discharge. Some of the cases in both groups were actively followed by the health department for the entire 4-year period or until death; others were discharged during the followup period because they became arrested, moved, were lost, or were considered uncooperative. Of the 135 survey cases, 11 were discharged because they became arrested compared with 9 of the 134 nonsurvey cases; 27 survey cases were discharged because they moved, were lost, or were considered uncooperative; 33 nonsurvey cases were so discharged.

Shown in table 3 is the status, according to health department records, of the 97 survey and

Table 3. Status of cases followed by health department on the fourth anniversary of the first report

Status	Survey		Nonsurvey	
	Number	Percent	Number	Percent
Total cases followed	97	100.0	92	100.0
Dead	13	13.4	42	45.7
In sanatoriums	16	16.5	11	11.9
At home with active tuberculosis	11	11.3	9	9.8
At home with inactive tuberculosis	57	58.7	30	32.6

92 nonsurvey cases actively followed by the health department during the entire 4-year period or until death, on the fourth anniversary of their being reported. Forty-five percent of the nonsurvey cases were dead, compared with only 13 percent of the survey cases. On the other hand, a larger proportion of survey than of nonsurvey cases were at home with inactive tuberculosis at the end of the study period, and a slightly larger proportion were in sanatoriums or at home with active tuberculosis at that time.

Probability of Death

The most completely recorded events in the files of the Minneapolis City Health Department during the 4-year followup period were deaths and periods of hospitalization. A life-table method has been used in analyzing mortality data, with the results shown in table 4. Cases withdrawn from observation are those who died or were discharged from health department supervision. Deaths refer to deaths from all causes. The cumulative probability of death for survey and nonsurvey cases is computed for the eight 6-month followup periods (probabilities are shown as percentages), showing total cases, and, separately, cases moderately advanced and far advanced at the time of discovery. (There were too few deaths among minimal cases for the computation of rates.)

Figure 1. Probability of death for total survey and nonsurvey cases, cumulated in successive 6-month intervals.

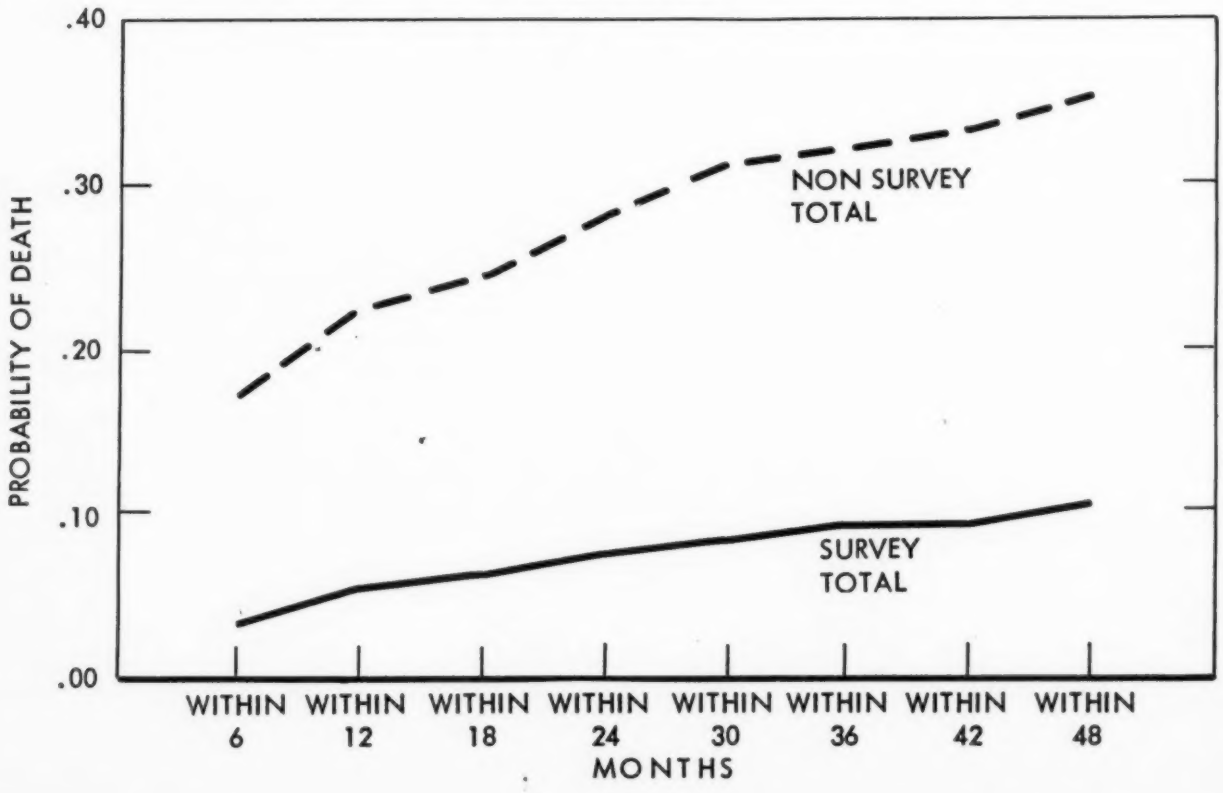
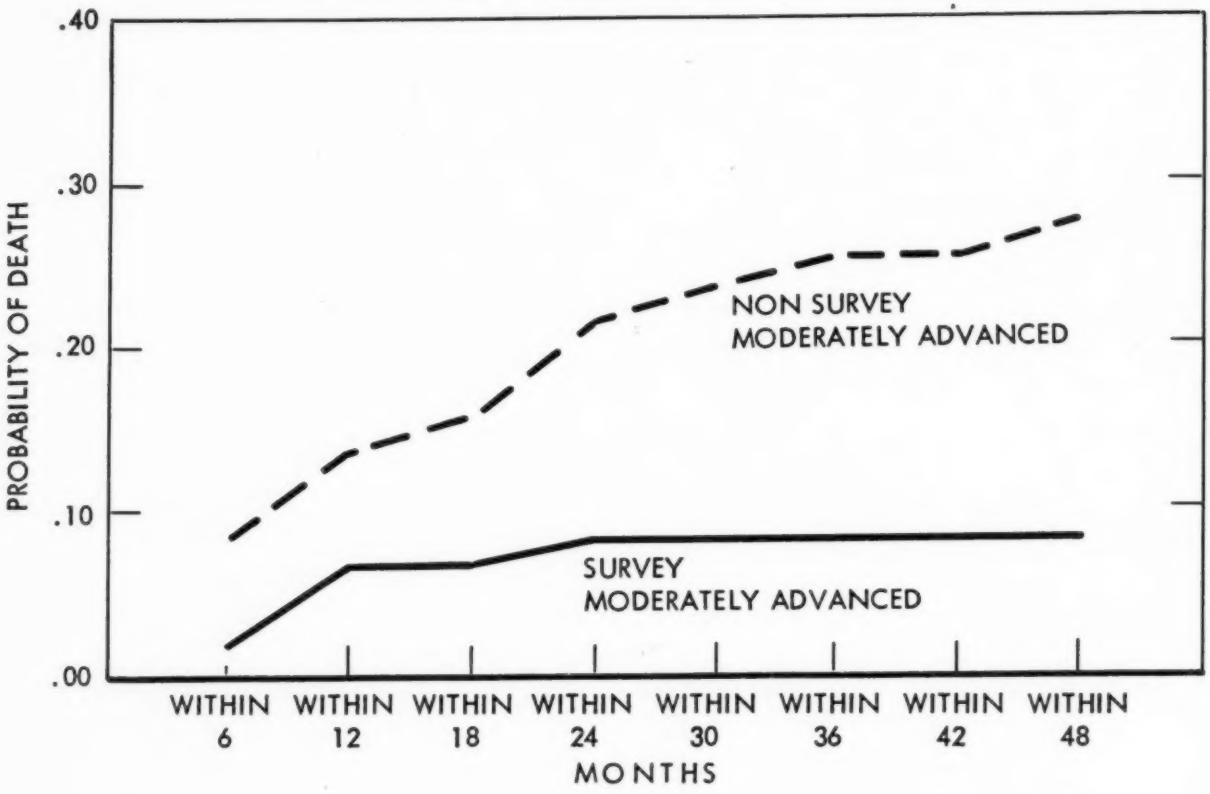


Table 4. Probability of surviving and of dying for patients with active tuberculosis, by stage of disease at time of first report and by method of discovery, for 8 consecutive 6-month periods of observation

Stage of disease	6-month period	Number at beginning of period l_x		Number withdrawn living during period W_x		Number dying during period d_x		Average number at risk $l_x - \frac{1}{2}W_x$	
		Survey	Nonsurvey	Survey	Nonsurvey	Survey	Nonsurvey	Survey	Nonsurvey
All stages (including minimal)	1	135	134	2	10	4	22	134.0	129.0
	2	129	102	4	1	3	7	126.0	101.5
	3	122	94	1	6	1	2	121.5	91.0
	4	120	86	2	7	2	4	119.0	82.5
	5	116	75	3	4	1	3	114.5	73.0
	6	112	68	7	1	1	1	108.5	67.5
	7	104	66	3	3	-------	1	102.5	64.5
	8	101	62	16	10	1	2	93.0	57.0
Moderately advanced	1	64	61	1	5	1	5	63.5	58.5
	2	62	51	2	1	3	3	61.0	50.5
	3	57	47	-------	1	-------	1	57.0	46.5
	4	57	45	1	3	1	3	56.5	43.5
	5	55	39	1	1	-------	1	54.5	38.5
	6	54	37	2	1	-------	1	53.0	36.5
	7	52	35	-------	----------	-------	----------	52.0	35.0
	8	52	35	6	6	-------	1	49.0	32.0
Far advanced	1	21	44	-------	1	2	16	21.0	43.5
	2	19	27	-------	----------	-------	4	19.0	27.0
	3	19	23	-------	3	1	1	19.0	21.5
	4	18	19	-------	----------	1	1	18.0	19.0
	5	17	18	1	2	1	2	16.5	17.0
	6	15	14	-------	----------	1	----------	15.0	14.0
	7	14	14	-------	2	-------	----------	14.0	13.0
	8	14	12	-------	----------	1	1	14.0	12.0

Stage of disease	6-month period	Percentage dying in given period $100\,q_x$		Percentage surviving in given period $100\,p_x$		Percentage surviving through preceding and current period $100\,hp_x$		Percentage dying in preceding and current period $100\,hq_x$	
		Survey	Nonsurvey	Survey	Nonsurvey	Survey	Nonsurvey	Survey	Nonsurvey
All stages (including minimal)	1	3.0	17.1	97.0	82.9	97.0	82.9	3.0	17.1
	2	2.4	6.9	97.6	93.1	94.7	77.2	5.3	22.8
	3	.8	2.2	99.2	97.8	93.9	75.5	6.1	24.5
	4	1.7	4.8	98.3	95.2	92.3	71.9	7.7	28.1
	5	.9	4.1	99.1	95.9	91.5	69.0	8.5	31.0
	6	.9	1.5	99.1	98.5	90.7	68.0	9.3	32.0
	7	-------	1.6	100.0	98.4	90.7	66.9	9.3	33.1
	8	1.1	3.5	98.9	96.5	89.7	64.6	10.3	35.4
Moderately advanced	1	1.6	8.5	98.4	91.5	98.4	91.5	1.6	8.5
	2	4.9	5.9	95.1	94.1	93.6	86.1	6.5	13.9
	3	-------	2.2	100.0	97.8	93.6	84.2	6.5	15.8
	4	1.8	6.9	98.2	93.1	91.9	78.4	8.2	21.6
	5	-------	2.6	100.0	97.4	91.9	76.4	8.2	23.6
	6	-------	2.7	100.0	97.3	91.9	74.3	8.2	25.7
	7	-------	----------	100.0	100.0	91.9	74.3	8.2	25.7
	8	-------	3.1	100.0	96.9	91.9	72.0	8.2	28.0
Far advanced	1	9.5	36.8	90.5	63.2	90.5	63.2	9.5	36.8
	2	-------	14.8	100.0	85.2	90.5	53.8	9.5	46.2
	3	5.3	4.7	94.7	95.3	85.7	51.3	14.3	48.7
	4	5.6	5.3	94.4	94.7	80.9	48.6	19.1	51.4
	5	6.1	11.8	93.9	88.2	76.0	42.9	24.0	57.1
	6	6.7	----------	93.3	100.0	70.9	42.9	29.1	57.1
	7	-------	----------	100.0	100.0	70.9	42.9	29.1	57.1
	8	7.1	8.3	92.9	91.7	65.9	39.3	34.1	60.7

Figure 2. Probability of death for survey and nonsurvey cases, moderately advanced at time of report, cumulated in successive 6-month intervals.



These probabilities of deaths are also shown in figures 1 to 3.

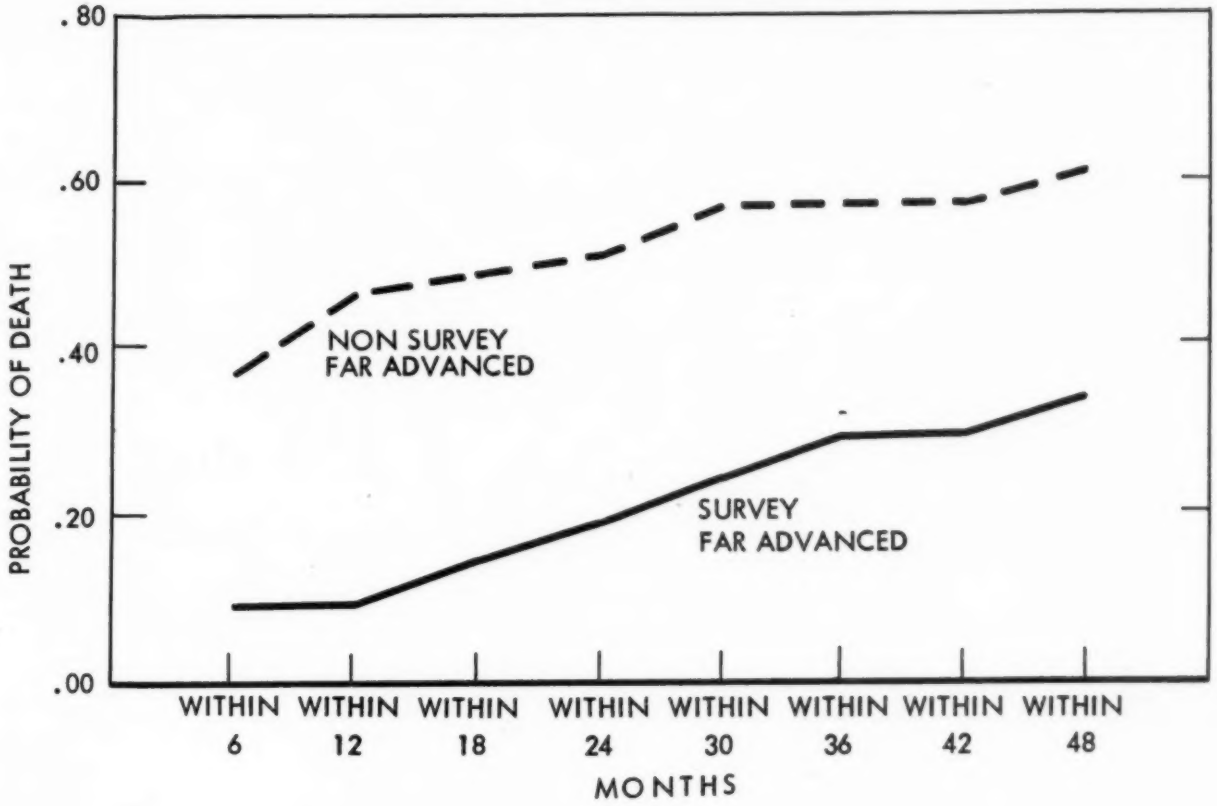
As shown in table 4 and figure 1, the chance of survey cases dying within the 4-year period was .103, or about 1 out of 10, whereas the chance of death in the nonsurvey group was .354, or about 1 out of 3. A large proportion of the deaths in the nonsurvey group occurred in the first 6-month followup period, when 17 percent of the nonsurvey cases died compared with only 3 percent of the survey cases. Even in subsequent periods, however, a somewhat higher death rate prevailed in the nonsurvey group.

Only part of the advantage survey cases apparently had over nonsurvey cases was due to the earlier stage of disease in which survey cases were first reported. Cases reported as moderately advanced showed probabilities of death within the 4-year period of .082 and .280 for survey and nonsurvey cases, respectively (table 4 and fig. 2); for far advanced cases, these probabilities were .341 and .607 (fig. 3). For moderately advanced cases, deaths occurred in the nonsurvey group at a slightly decreasing rate during the entire followup period; in the survey group, no deaths were observed after the second year. For far advanced cases, however, after a high initial mortality, the nonsurvey group appeared to have about the same mortality experience as the survey group.

Hospitalization

The amount of hospitalization required by tuberculosis cases is of considerable interest, particularly as it relates to savings in hospital care that might result from early discovery. Of the 135 survey cases, 109 (81 percent) were hospitalized during the 4-year followup period; of the 134 nonsurvey cases, 113 (84 percent) were hospitalized. Ten percent of the hospitalized survey cases were hospitalized more than once, whereas only 5 percent of

Figure 3. Probability of death for survey and nonsurvey cases, far advanced at time of report, cumulated in successive 6-month intervals.



the hospitalized nonsurvey cases had more than one hospitalization.

In all, survey cases received a total of 2,088.6 months of hospitalization during the 4-year followup period; nonsurvey cases, 1,785.9 months. Thus, although about the same proportion of both groups were hospitalized, survey cases had a tendency to be readmitted more frequently than nonsurvey cases and to require more total months of hospitalization.

Discussion

It has been shown that within a 4-year period the probability of death among active cases of tuberculosis discovered as the result of usual case-finding methods greatly exceeds the probability of death among comparable cases discovered by communitywide X-ray surveys.

In view of the significance of survey-discovered tuberculosis as revealed by the results of bacteriological examination and by the amount of hospitalization received, there is good reason to believe that, if a survey had not been conducted, many of the survey-discovered cases would have gone on to a more symptomatic and more advanced stage, to be finally discovered by some other case-finding procedure.

Because the 4-year followup of survey cases roughly covers the years 1948 to 1952, whereas the 4-year followup period for nonsurvey cases represents an earlier period—roughly, the years 1947 to 1951—the survey cases probably had some advantages in therapy not available to the nonsurvey group. This may partly account for their more favorable mortality experience. However, this advantage could not have accounted for a difference in mortality as large as that observed.

It seems probable, then, that one of the real values of tuberculosis case detection through

chest X-ray surveys is a saving in lives as the result of treatment early in the course of the disease. This value is in addition, of course, to the prevention of spread of infection to others that must have occurred as the result of the discovery and isolation of infectious tuberculosis before it ordinarily would have been brought to light.

The fact that cases of active tuberculosis discovered by the Minneapolis communitywide chest X-ray survey received about 17 percent more hospitalization during the 4-year follow-up period than did active cases discovered by other means is important in planning for hospitalization facilities in areas where intensive case-finding efforts are to be carried out. Such efforts probably do not reduce the amount of hospitalization required for each case reported but rather increase it.

The additional hospitalization given the survey-discovered cases could all be accounted for by the lower mortality in this group compared with the mortality in the nonsurvey group. This resulted in more cases being available at any given time for hospitalization. By use of a life-table technique similar to that used in table 4, it can be shown that, had the same mortality and withdrawal rates prevailed in the two groups of cases, the survey-discovered cases would actually have received somewhat less hospitalization than the nonsurvey cases.

From the foregoing it would appear that the underlying assumption in the conduct of chest X-ray programs—that tuberculosis cases benefit by discovery through chest X-ray surveys—is correct and that the chances of an unfavorable outcome for cases of tuberculosis are reduced as the result of their discovery in these programs. There is little doubt as to the importance of aggressive case-finding efforts in our attack on this disease.

Summary

1. In order to estimate the value of tuberculosis case discovery through chest X-ray surveys, a group of active cases of pulmonary tuberculosis discovered by a communitywide chest X-ray survey conducted in Minneapolis, Minn., in 1947 was compared with a group of active pulmonary cases reported to the city health department just prior to the survey.

2. The two groups of cases were found to be similar in terms of age and sex and of bacteriological significance. However, 37 percent of the survey cases were discovered in the minimal stage, compared with 22 percent of the nonsurvey cases. Conversely, only 16 percent of the survey cases were in a far advanced stage, compared with 33 percent of the nonsurvey cases.

3. Using a life-table method to study the survival of these two groups of cases over a 4-year period, it was estimated that the chance of a survey case dying within 4 years was 1 out of 10, whereas the chance of a nonsurvey case dying was 1 out of 3.

4. It was concluded that the differences observed in the outcome of tuberculosis in the two groups of cases studied are to some extent a reflection of the value of early case discovery through intensive tuberculosis case-finding efforts.

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Curriculum for Training X-ray Film Readers For Mass Surveys

By Armand E. Brodeur, M.D., M.R.

CHEST X-RAY survey programs are conducted periodically in the United States by both public and private institutions. Since good film interpretation is essential to the effective operation of these programs, the Public Health Service has, in the past few years, developed a film reader training course.

It should be understood that such a training program prepares physicians only for the screening out of chest abnormalities and that patients so selected are referred to private physicians or health agencies for definitive diagnosis and treatment. Candidates for the course must have a medical degree from an approvided medical school and at least 1 year of approved internship.

The training period may last only a few days, or it may take from 6 to 8 weeks depending upon the needs and the previous experience of the trainees. Individuals must measure up to established standards of performance.

The Course and Materials

Each student must thoroughly study Pendergrass and Hodes' article, The Healthy Chest (*1*). A series of 14- x 17-inch normal chest films is shown to the students. As a rule, the series consists of 5 or 6 normal chest X-rays of male and female patients of varying stature. Parts of the normal chest, the soft tissues, bony skeleton, heart, great vessels, and lung parenchyma are examined on the X-ray films. For purposes of discussion, each of these structures is outlined so as to be distinguishable from surrounding organs. A full 2-hour period is usually allotted to the discussion and examination of the healthy chest.

Students must learn to identify anterior and posterior ribs, ascending aorta, sternoclavicular junction, and other such structures. Deviations from normal anatomy which are not considered pathological in normal cardiorespiratory function are demonstrated. Since most of the student readers will eventually handle the survey type of X-ray film, they must be able to recognize artefacts and any other factors which increase the difficulty of accurately interpreting normal roentgenograms. For this purpose a roll of 70-mm. chest films with normal variants and selected pathology is presented and studied. Examples of cervical ribs, bifid ribs, and other bony anomalies are included on the film. The osteoma, azygos lobe, calcified nodes, dextrocardia, situs inversus, and unilateral and bilateral mastectomy are other items on the film. Metal fasteners, breast prosthesis, nonopaque costume jewelry, and form molding devices are shown. Good examples of interesting pathology clearly evident on the X-ray make up part of the collection. Some such examples are hiatus hernia, pericardial effusion, von Recklinghausen's neurofibromatosis, and silicosis.

Another of the materials used in the training course is a roll of 70-mm. chest films showing the normal heart, organic heart disease, and congenital heart disease. Interpretation of the heart shadow does not receive major emphasis in the standard film readers' course, but increasing awareness of the presence of heart disease, particularly in middle-aged individuals, demands that the chest film reader of today be adept at interpreting the more obvious heart abnormalities and that he avoid false positive readings wherever possible. It would be impractical to devote much time to the differential diagnosis of heart disease in a course of this kind since experts frequently need more than

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a single posteroanterior film for accurate interpretation. However, during the short period of time which is devoted to organic and congenital heart disease, diagrams and heart models are used to explain the methods of evaluation.

After the student is familiar with the normal chest structures and the more common deviations from the norm, he is given a general review of chest pathology. A roll of 70-mm. chest films showing various kinds of pathology and including most of the common and many of the rarer lung lesions is discussed. Lesions appearing in minimal tuberculosis, bronchogenic carcinoma, lobar pneumonia, arteriovenous fistula, and beryllium inhalation are observed. Whenever possible the technique of differential interpretation of a given lesion is discussed. No film reader is expected, however, to achieve 100 percent accuracy in differential roentgen interpretation. Larger, 14- x 17-inch, films showing common and rare chest lesions are used for purposes of emphasis. Actual survey conditions are reproduced, and the student is asked to interpret both a large number of 70-mm. films taken from past surveys and the 14- x 17-inch confirmatory films. Through this experience the student learns that the difference in appearance of identical lesions on large and small films is only slight.

In the past, screening programs have been primarily concerned with the discovery of pulmonary tuberculosis. For this reason 14- x 17-inch films of pulmonary tuberculosis are thoroughly examined, and the nature and appearance of the disease in all of its forms and in every age group is studied. The ever-increasing awareness of the prevalence of lung cancer and the probable association of some solitary round lesions of the lung with pulmonary cancer has prompted the inclusion of a special session devoted entirely to this subject.

In the film reader course individual supervision is always desirable. However, in large classes this must sometimes be subordinated to the achievement of group coverage. Projection devices are best suited to large groups. Since this is so, it is more convenient when working with such a group to use a roll of miniature film, which can later be adapted for use in individual viewers, than it is to assemble large numbers of glass slides, which may be used for projection purposes only. The projection of roll film is accomplished by the use of an insert which, when fitted on a conventional slide projector, serves as the holder for the roll film. One roll contains enough material for an entire teaching session. As many as 400 individual pictures can be put on a single roll of film, the weight of which is hardly more than that of 12 projection slides. The advantage of this technique in terms of bulk alone is tremendous.

Sample Chest Film Reader Orientation Course

(20-day course, 2 periods daily)

1. The X-ray—a brief orientation on the production and nature of X-rays:	
a. Physical aspects	1 period.
b. Teleroentgenography and the advantages of positioning	1/2 period.
c. Photofluorography and fluoroscopy	1/2 period.
2. The healthy chest:	
a. Normal 14- x 17-inch films	1 period.
b. Normal 70-mm. films	1 period.
c. Survey of deviation from average normal	1 period.
d. The heart—including normal contours, physiology, and pathological anatomy	1 period.
3. The pathological chest:	
a. Survey of various kinds of chest pathology	3 periods.
b. Tuberculosis—primary and reinfection types	3 periods.
4. Film interpretation:	
a. 70-mm. film reading and 14- x 17-inch confirmation	24 periods.
5. Reader efficiency testing	4 periods.

Evaluating the Training

One means of evaluating the film reader training program is by testing reader efficiency. Each trainee is tested in film reading ability at the beginning of the course, halfway through

the course, and upon its completion. In this way, the relative rate of progress is measured and individual weaknesses are highlighted.

X-rays from past surveys are used in the test. Each has been clinically evaluated and positive and negative cases proved so far as possible. After each test, films are reviewed, and trainees have an opportunity to examine closely the films they are most likely to misinterpret. Although the same films are used for each test, the danger of students' remembering the correct interpretation of the films from one test to the next is negligible. Since actual survey conditions are reproduced for testing, there are included among the films used some radiographically positive cases which were proved clinically negative and some radiographically negative cases which were proved clinically positive. Students are scored on their ability to make accurate interpretations on the basis of radiographic evidence only.

Summary

Candidates for the course in reading miniature chest X-ray films must have a medical degree from an approved medical school and at least 1 year of approved internship. The course prepares physicians only for the screening out of chest abnormalities.

The materials used in the film reader course consist of a series of normal 14- x 17-inch chest X-ray films; a roll of 70-mm. chest films with normal variants and selected pathology; a roll of 70-mm. chest films showing the normal heart, organic heart disease, congenital heart disease, and copied diagrams; a roll of 70-mm. chest films depicting various kinds of chest pathology; 14- x 17-inch films from museum files containing typical examples of most of the common and some rare chest lesions; 70-mm. films taken from past surveys with the 14- x 17-inch confirmatory film for each case; selected groups of 14- x 17-inch films showing the various forms of pulmonary tuberculosis; 3-dimensional rubber (*2*) and 2-dimensional plastic heart (*3*) models; and a specially designed adapter which converts a slide projector to a 70-mm. roll film projector.

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Departmental Announcement

John L. Harvey was appointed, October 1954, Deputy Commissioner of the Food and Drug Administration, Department of Health, Education, and Welfare. He had been Associate Commissioner since 1951.

A member of the career civil service, Mr. Harvey started 29 years ago as a food and drug inspector at Seattle, where he was later to become chief of the Seattle station. He became chief of the western district in 1937, and when control of the FDA field activities was centralized in Washington, D. C., in 1948, he was appointed director of regulatory management.

Mr. Harvey studied law at the Jefferson College of Law in San Francisco and chemistry and bacteriology at Virginia Polytechnic Institute. He also attended Tulane University College of Medicine.

Dr. Dean.

Dr. Erickson.

Dr. Florio.

Dr. Haas.

Dr. Miller.

The Board of Editors of Public Health Reports

The Surgeon General of the Public Health Service has announced the following recent appointments to the Board of Editors, Public Health Reports:

H. TRENDLEY DEAN, D.D.S., secretary of the Council on Dental Research, American Dental Association, Chicago, and former director of the National Institute of Dental Research, Public Health Service.

HAROLD M. ERICKSON, M.D., M.P.H., secretary and State health officer, Oregon State Board of Health, Portland, and president, Association of State and Territorial Health Officers.

LLOYD FLORIO, M.D., Dr.P.H., on leave as professor of preventive medicine and public health, University of Colorado School of Medicine, Denver, and presently manager, Health and Hospitals, City of Denver.

VICTOR H. HAAS, M.D., a medical director in the Regular Corps of the Public Health Service, and serving since 1948 as director of the National Microbiological Institute, Public Health Service, Bethesda, Md.

SEWARD E. MILLER, M.D., a medical director in the Regular Corps of the Public Health Service, and since April 1954 chief of the Division of Special Health Services, Bureau of State Services, Public Health Service, Washington, D. C.

The new members of the board replace the following; John W. Knutson, D.D.S., Dr.P.H., Assistant Surgeon General and chief dental officer, Public Health Service, Washington, D. C.; Fillmore Sanford, Ph.D., executive secretary of the American Psychological Association, Washington, D. C.; George M. Uhl, M.D., M.S.P.H., health officer, Los Angeles, Calif.; and Russell M. Wilder, M.D., Ph.D., former director of the National Institute of Arthritis and Metabolic Diseases, Public Health Service, Bethesda, Md., now retired and living in Rochester, Minn.

Other members of the board of editors are:

CHAIRMAN EDWARD G. MCGAVRAN, M.D., M.P.H., dean of the University of North Carolina School of Public Health, Chapel Hill.

GAYLORD W. ANDERSON, M.D., Dr.P.H., director, University of Minnesota School of Public Health, Minneapolis.

JUSTIN M. ANDREWS, Sc.D., LL.D., Assistant Surgeon General and associate chief for program, Bureau of State Services, Public Health Service, Washington, D. C.

HALBERT L. DUNN, M.D., Ph.D., chief of the National Office of Vital Statistics, Public Health Service, Washington, D. C.

MARTHA M. ELIOT, M.D., Sc.D., chief, Children's Bureau, Department of Health, Education, and Welfare. Washington, D. C.

RUTH FREEMAN, R.N., Ed.D., associate professor of public health administration, Johns Hopkins University, Baltimore.

BASIL C. MACLEAN, M.D., M.P.H., director, Strong Memorial Hospital, University of Rochester, Rochester, N. Y.

M. ALLEN POND, M.P.H., assistant to the special assistant for health and medical affairs, Department of Health, Education, and Welfare, Washington, D. C.

Dr. McGavran.

Dr. Anderson.

Dr. Andrews.

Dr. Dunn.

Dr. Eliot.

Dr. Freeman.

Dr. MacLean.

Mr. Pond.

Milk Sanitation, Communicable Disease, And Public Health

By JAMES H. STEELE, D.V.M., M.P.H.

MILK SANITATION began to exert an influence on communicable disease control and public health near the close of the 19th century, some years after the first outbreak of milkborne disease was recorded. With the development of the sciences of epidemiology and bacteriology, some of the early public health observers and investigators had begun to suspect, on the basis of their epidemiological findings, that milk might be a vehicle of infection. The isolation of the microbic causes of tuberculosis, typhoid fever, and Malta fever laid the basis of milk sanitation, which was to develop rapidly thereafter. The finding of the diphtheria, streptococcus, and staphylococcus organisms in milk emphasized the necessity for improving milk sanitation.

In spite of some resistance to the theory of epidemiology, within a few years of the isolation of many of these organisms it was widely accepted that tuberculosis, typhoid fever, diphtheria, and streptococcal diseases, including sore throat and scarlet fever, were often spread by contaminated milk.

Dr. Steele is chief of the Veterinary Public Health Section, Communicable Disease Center, Public Health Service, Atlanta, Ga. *This paper is based on one presented at a plenary session of the 15th International Veterinary Congress, which was held in Stockholm, Sweden, August 9–15, 1953.*

By 1900 the way was clear for the development of a scientific public health program along two major lines, namely, communicable disease control and sanitation. The health menace involved in the use of a milk supply could then be determined by precise bacteriological procedures, and the need for pasteurization could be proved. These bacteriological methods and knowledge could also be applied to other foods and to water, sewage, and the environment. The diagnosis of communicable diseases of man and animals could be confirmed. Sanitation now had a scientific basis for control of diseases which are spread by direct contact between man and man, and between man and animals.

In 1909, the Public Health Service issued Hygienic Laboratory Bulletin 56 (*1*), which listed 500 outbreaks of milkborne diseases in various parts of the world between 1857 and 1907. However, the 500 outbreaks represented only the few that had appeared in the literature. According to this report, the first recorded summary of epidemics of diseases spread by milk was prepared by Ernest Hart of England in 1881. Hart cited 50 epidemics of typhoid fever, 15 epidemics of scarlet fever, and 4 epidemics of diphtheria. The first cases of typhoid fever shown to be due to contaminated milk occurred at Penrith in Great Britain in 1857. A decade later the first published report of scarlet fever traced to an infected milk supply came from this same community. In 1877, diphtheria was added to the list of milkborne diseases when

it was described in Surrey, England. Shortly thereafter there were many similar reports from Western Europe and North America.

In 1947, the Public Health Service published a list of epidemics of milkborne diseases which occurred between 1923 and 1945 (*2*). The 955 outbreaks during this period included 40,177 cases of sickness and 804 deaths caused by infected milk. There were 440 outbreaks of typhoid fever (7,449 cases), 27 of paratyphoid (1,063 cases), 202 of scarlet fever (19,190 cases), 18 of diphtheria (324 cases), 20 of dysentery (1,413 cases), 196 of food poisoning and gastroenteritis (9,780 cases), 34 of brucellosis (275 cases), and 18 outbreaks of miscellaneous diseases (683 cases).

The 34 reported brucellosis outbreaks were only a small fraction of the total that occurred during that period (*2*). It is conservatively estimated that one-third of the brucellosis cases were due to the ingestion of infectious milk or milk products and that the remainder were due to occupational exposure.

Even though the number of cases of bovine-type tuberculosis in man was never more than a small percentage of the total cases of tuberculosis, its elimination and control was one of the first major advances in the reduction of tuberculosis in man. Less than 30 years ago extrapulmonary tuberculosis of bovine origin was common in any American community. Today it is an unknown disease among children in the United States.

During the last decade of the period 1923–45, the case rate for many of the milkborne diseases dropped rapidly. Dauer (*3*) states that in 1952 comparatively few of the disease outbreaks reported were traced to milk or milk products.

Tuberculosis

From a world viewpoint, of the diseases of the cow which are transmissible to man, the most important economically and from the public health standpoint is tuberculosis. For many years most public health workers believed that bovine tuberculosis in man was a disease only of ingestion which produced an extrapulmonary form of disease. Sigurdsson (*4*), with the publication of a study made in rural Denmark, further supported the concept previously developed by Griffith (*5*) and Lange (*6*) that bovine-type tuberculosis was not only a disease of ingestion of infectious milk, but that it was spread by contact with infected animals which caused pulmonary disease in man. In his study, Sigurdsson typed the organism recovered from 566 cases of pulmonary tuberculosis in human beings, 165 of them from rural areas. Of the rural patients, 67 (40.6 percent) were infected with *Mycobacterium tuberculosis* bovine type, whereas only 15 (3.6 percent) of the urban patients had this type of infection.

Following up the source of infection of the rural cases, Sigurdsson found that 94 percent of those with bovine-type tuberculosis had been in contact with infected cattle within the past 2 years. Living *Myco. tuberculosis* organisms were found in the dust and dirt of the stables. The importance of the shedding of these organisms in bovine feces had been recognized for 50 years but only in connection with external contamination of milk and not as a source of pathogens for airborne infections. Sigurdsson's study is significant in that it demonstrated the danger to man from contact with infected animals, quite apart from the well-known and long-appreciated danger arising from the ingestion of infected milk. Meyer (*7*) has repeatedly pointed out that *Myco. tuberculosis* bovine type is just as virulent for man as the human type—perhaps even more so.

The importance of bovine tuberculosis as a disease of ingestion is illustrated by the following episodes. In 1948, Ohio Department of Agriculture veterinarians found tuberculosis reactors in a large herd of milking cows when they tested the herd by interdermal inoculation of tuberculin. The infected animals were sent to an abattoir where they were slaughtered and post-mortem examination was carried out. Most of the reactors showed gross lesions of tuberculosis. Investigation by the health authorities revealed that raw milk from this herd had been used in the community, including the local elementary school. A survey was made of the children in this school. The majority reacted positively to the Mantoux skin test, although many of them had been examined only 2 years before and most were negative at that time. A number of children, including one

child on the farm where the infected cows were located, developed enlarged cervical lymph nodes.

Since the report of this episode, only 5 cases of bovine-type tuberculosis have been found in man in the United States. Three of the patients were elderly persons hospitalized for other reasons; the fourth was a young housewife who had spent her entire life in the city; and the fifth was a war bride who had been in the United States less than a year when the infection was discovered. She had the pulmonary type of the disease.

The influence of pasteurization on the prevalence of bovine-type tuberculosis in children was dramatically illustrated by Price (*8*) in Toronto, where pasteurization is compulsory. He demonstrated that no bovine tuberculosis was seen among persons in the city, whereas 15 percent of the tuberculosis in children living in the surrounding rural areas was of the bovine type. Blacklock (*9*) relates a similar experience in Glasgow, where the milk is also pasteurized. He states that the mortality from tuberculous meningitis of the bovine type is less than one-quarter of the rate in rural areas of the western counties from which Glasgow draws its milk supplies, and that the morbidity rate in "surgical tuberculosis" due to bovine infection is one-fifth of the rate in rural areas. Reilly (*10*) states that the decrease in tuberculosis of the bovine type in Northern Ireland must be due to the increased use of pasteurization. In 1939 only 7 percent of the milk was pasteurized. At the end of 1949, the amount of heat-treated and grade A milk had increased to 90 percent.

Human-Type Tuberculosis in Cattle

It is important to emphasize in public health practice that the control of bovine tuberculosis is also dependent on the prevention of contact between noninfected animals and persons with open infections. In the late 1920's, veterinarians in Finland called attention to the fact that persons with open lesions of pulmonary tuberculosis may spread their infection to cattle. In cattle, a high incidence of positive tuberculin reactors with few or no anatomical lesions occurs as a result of such exposure. Although the human type of tuberculosis does not become clinical in cattle, it introduces a factor of uncertainty into the interpretation of tuberculin tests.

During the past two decades, there have been reports of human-type tuberculosis infection of cattle in various parts of the world, usually among animals on farms where tuberculous employees were in contact with them. Human-type tuberculosis causes cattle to react to the tuberculin test but does not produce generalized disease. Unfortunately, man can be a carrier of bovine-type tubercle bacilli which can cause serious generalized tuberculosis outbreaks among cattle. Such carriers may account for some of the unexplained sporadic outbreaks of tuberculosis in cattle in disease-free herds. The control of tuberculosis in man is important to good animal health, and the elimination of the bovine type of tuberculosis infection in man is dependent upon eradication of the disease in animals.

First Organized Public Health Function

Recognition that human tuberculosis of the bovine type could be controlled by animal testing and milk pasteurization was the basis of many of the early milk sanitation programs, and these procedures were the first efforts by many communities to control tuberculosis in man. Shortly after the turn of the century, when raw milk was widely used, cities began promulgating milk ordinances that required the testing of all cows for tuberculosis. This led to the development of milk sanitation and inspection activities which were based on the certified milk program practices. In many instances the milk sanitation program was the first organized public health function. Shortly thereafter, some cities began organizing full-time health departments to control communicable disease and improve sanitation.

The first certified milk program in the United States was organized in 1893 in Essex County, N. J. This program was under the direction of the local medical society, which set certain standards as to the fat content and bacterial count of milk, the tuberculin testing of cows, and dairy sanitation. The actual amount of certified milk sold was small, but the certified dairies set an example and furnished a model for the dairy industry.

It was evident from the early experience of

the certified milk commissions that clean milk could be obtained but that maintaining the safety and wholesomeness of the milk presented a different problem. Experience of the past 50 years has shown that the complete exclusion of diseased animals from dairy herds is an ideal seldom achieved. There are always some cows with mastitis or other infections of public health significance. The danger of milk contamination by human beings is always present. The organisms causing tuberculosis, septic sore throat, typhoid fever, diphtheria, scarlet fever, and other human disease can readily contaminate any milk supply. When this was realized, it became evident that the only safe milk is milk which is kept physically clean and then made safe by pasteurization.

With the rapid development of pasteurization, tuberculin testing of cows lagged in some areas of the United States, but during the decade 1920–30 many cities adopted tuberculosis testing even for milk that was to be pasteurized. The demand by the large cities that milk be from tuberculosis-free cows was one of the major reasons for the success of the national bovine tuberculosis eradication program in the United States.

Brucellosis

Brucellosis was first described on the island of Malta in 1861 and was called "Mediterranean fever" or "recurrent gastric fever." Its etiological agent was discovered by Bruce in 1887, but it was not until 1905 that it was reported as a milkborne disease, contracted by the ingestion of raw milk from goats infected with brucellosis. *Brucella abortus* was first described by Bang in 1898. In 1911, Schroeder and Cotton (*11*) suggested the possibility that *B. abortus* was pathogenic for man and urged the pasteurization of milk to prevent brucellosis. In 1918, Alice Evans reported that *Bacterium melitense* was difficult to distinguish from *Bacterium abortus* and that these two organisms might be related (*12*). Shortly thereafter, Meyer and Shaw proposed the generic term *Brucella* for *Micrococcus melitensis*, *Bacillus abortus*, and *Bacillus suis*. *Brucella suis* was not isolated from cows' milk until about 1929, and the first sizable epidemic occurred in Iowa soon after that date. In the 1930's, Taylor and his associates (*13*) reported outbreaks of brucellosis in southern France attributed to *Brucella melitensis* from cows' milk.

Brucellosis cases reported in the United States, 1927–52

Year	Number of cases	Year	Number of cases
1927	112	1940	3, 310
1928	669	1941	3, 484
1929	975	1942	3, 228
1930	1, 435	1943	3, 734
1931	1, 578	1944	4, 386
1932	1, 502	1945	4, 959
1933	1, 788	1946	5, 887
1934	2, 017	1947	6, 147
1935	2, 008	1948	4, 991
1936	2, 095	1949	4, 235
1937	2, 675	1950	3, 510
1938	4, 379	1951	3, 139
1939	3, 501	1952	3, 116

Beginning in 1927, when brucellosis was made a reportable disease in the United States, and continuing through 1947, there was a constant increase in reported cases, but after 1947 a precipitous decrease occurred (see table). From a study of brucellosis incidence in the United States in 1949, Steele and Emik (*14*) concluded that there were 10,709 estimated cases that year as compared to 4,235 cases officially reported. It is believed that the reporting of the disease is no more complete today than it was in 1949.

The greatest increase in brucellosis cases was reported between 1938 and 1947, a period which parallels the increase in domestic animal population and in the prevalence of animal brucellosis. During this same period, there was an expansion of the dairy industry, accompanied by an increased use of pasteurization, and the reported incidence of urban cases declined. Inasmuch as most of the urban cases were usually attributed to the ingestion of contaminated dairy products, it is quite apparent that pasteurization was making itself felt, although it should be remembered that the diagnostic criteria were at the same time becoming much more critical, a factor which would tend to eliminate some cases that previously would have been diagnosed as brucellosis.

After 1948, the use of pasteurized dairy products increased very rapidly in urban, rural, and resort areas. In addition, some areas were be-

ginning to require that all fluid milk, whether to be pasteurized or to be distributed to the consumer in the raw state, be from herds that were free of brucellosis or were under some kind of control plan. In 1950, Illinois adopted requirements that by 1955 all grade A milk, whether pasteurized or not, must be from herds that are free of brucellosis. This action had a very stimulating effect on the neighboring States supplying Illinois with milk, and they immediately took steps to expand their State control programs. Since 1950, a number of other States and large cities have adopted similar requirements. The 1953 recommendations of the Public Health Service Milk Ordinance and Code (*15*) state that "within 3 years at the most after the adoption of this ordinance, all milk and milk products for pasteurization shall be from herds qualified by the State Livestock Sanitary Authority as following plan A or plan B approved by the Bureau of Animal Industry for the eradication of brucellosis." This action is very similar to the adoption of compulsory tuberculosis testing of milk cows 25 or 30 years ago. The effect will be far reaching, and within a decade the prevalance of bovine and human brucellosis will be reduced even further. It may be that in another decade, local milk regulations will require that all types of domestic animals on farms where milk is produced be free of brucellosis.

Q Fever

Q fever was first described in 1937 among abattoir workers in Brisbane, Australia. It was not considered an important disease until 1944, when outbreaks of atypical pneumonia among Allied and Axis troops in Italy and Greece were identified as Q fever. Since then it has been found in many countries of Europe, North Africa, and the Middle East, and in the United States. The principal sources of human infection are now known to be cattle, sheep, and goats. All of these animals, though apparently well, may excrete the organism in the feces, urine, milk, placenta, and fetal membranes. Man is probably infected either by inhaling dust contaminated with these excreta or by drinking contaminated milk. Bell and his associates (*16*) pointed out that the infection rates among persons who used raw milk were 10 times higher than the rates among those who used only pasteurized milk.

The organism of Q fever is remarkably hardy, and the usual temperature used in pasteurization of milk is not adequate for its complete destruction. It also resists many disinfectants and can persist in dust for long periods. In a study of 66 cases in England (*17*), it was found that 26 patients drank unpasteurized milk. A study of the milk supply of 20 of these revealed that *Coxiella burnetii* was present in the milk supplied to 10 patients, and that the milk received by 4 other patients was from herds with serologic evidence of Q fever. The remaining 6 patients received raw milk in which there was no evidence of infection. Many of the 26 persons who drank raw milk also lived on farms, which made it difficult to determine the cause of infection, but in 13 cases there was no obvious source of infection other than the milk supply.

To date, little progress has been made in the control or prevention of Q fever in endemic or enzootic areas. Some promising results on the use of vaccines in cattle are under study in the western part of the United States. Most communities that are concerned with Q fever as a public health problem turn to pasteurization as one means of control. As stated earlier, pasteurization may not always destroy all the organisms present, but it does render the milk less infective and is probably reducing the hazard to man of milk naturally infected with the Q fever organism. So far as can be determined at this time, there is no evidence that pasteurized milk has produced the disease in man. There are no recommended public health practices for dealing with the problem other than pasteurization, but with the continued research in North America and Europe new control techniques should evolve.

Other Animal Disease Problems

Anthrax, salmonellosis, streptococcal and staphylococcal mastitis, torulosis, and foot-and-mouth disease have all been described by various authors as milkborne diseases. In many instances, milk sanitation practices have influenced the course of control of these diseases.

With the possible exception of anthrax, most of these problems can be handled by good milk sanitation practices, including pasteurization. Fortunately, nature helps with the problem of anthrax by reducing or cutting off lactation. There are no reports of milkborne or meatborne anthrax in the United States, according to available information (*18*).

Salmonellosis infections in cattle are not rare, but the pasteurization of milk is an effective procedure in preventing transmission of the infection to man.

Streptococcal and staphylococcal mastitis in cows is a common problem throughout most of the world, but except for the strains of the organisms that are toxin producers, they do not threaten human health if milk is properly pasteurized. The toxins formed by some strains of streptococcus and staphylococcus will survive pasteurization. These toxins produce vomiting and prostration of short duration, but the dilution effect of the milk probably prevents most food poisoning of this type in man.

Torulosis, or cryptococcosis, is a rare infection in man and even more rare in cattle. A mycotic infection primarily of man, it involves the central nervous system. It also produces meningitis, skin lesions, and pneumonic symptoms. In cattle, the symptoms are many and varied, but the most important from a public health point of view is mastitis. Inasmuch as the source of the disease in man is unknown, the outbreaks reported in dairy herds have been studied as to their public health hazard. Thus far no human infection has been found associated with infected dairy herds. *Cryptococcus neoformans*, the causal agent, can readily be isolated from the milk of affected cows, and it is readily destroyed by pasteurization (*19*).

Foot-and-mouth disease causes infection in man only under rare circumstances. The early medical and public health literature carried many reports of its spread by milk, but in recent years no conclusive reports have appeared. If the virus should appear in milk, it would be destroyed by pasteurization.

Recent reports of the propagation of duck virus, Newcastle disease virus, and the virus of human influenza A, Puerto Rico 8 (PR8), for 2 weeks in the bovine mammary gland suggest many new potential problems (*20*). The bovine mammary gland, one of the best natural sites for the propagation of microbic agents, should be examined more critically with regard to its potential health importance.

Pasteurization

Pasteurization is one of the most far-reaching sanitary practices that has been introduced into public health. The process was first applied to wine by Pasteur less than 100 years ago to prevent souring and abnormal fermentation. The first practical application of heat treatment of milk was made by Franz von Soxhlet in 1886 when he systematized and popularized the idea of sterilizing the milk for use by infants. Germany and Denmark were the first countries to accept this principle. In America, the heat treatment of milk was described by Abraham Jacobi as early as 1873 and reiterated in 1889 after von Soxhlet published his recommendation. In 1895, a Danish pasteurizing machine was introduced into this country with the assistance of Nathan Straus. During the next decade, Rosenau, Parker, and Theobald Smith advanced the cause of pasteurization (*21*).

The pasteurization time and temperature necessary to insure a safe milk are calculated from the thermal death curve of the tubercle bacillus, *Myco. tuberculosis*. At the time pasteurization was introduced, this organism was considered to be the most resistant pathogen found in milk, and the temperature and time used in pasteurization ranged from 138° F. (59.1° C.) for 20 minutes to 160° F. (70.9° C.) for 20 seconds. Later, in controlled experiments, it was found that the size of the inoculum may cause some variation in the time and temperature necessary to destroy the bacterium. For many years, the recommended pasteurization temperature was 143° F. (61.4° C.) for 30 minutes or 161° F. (71.6° C.) for 15 seconds. In recent years these temperatures have been increased, especially as cream lines became less of a competitive factor and the practice of homogenization came into use. This upward revision has also been influenced by the observation of investigators in England and California that *C. burnetii* was not always destroyed by the above recommended pasteurization

temperatures. Enright (*22*) has pointed out that *C. burnetii* will survive 143° F. when 10,000 infectious guinea pig doses are present in 1 cc. of milk. There is no survival when the temperature is raised to 145° F. (62.7° C.) for 30 minutes. If the inoculum is increased above the 10,000 guinea pig doses per 1 cc. of milk, it is possible that some *C. burnetii* organisms may survive 145° F. (62.7° C.). Inasmuch as no naturally infected milk has been found which contained more than 10,000 infectious guinea pig doses, the survival of high population is only of theoretical interest. Investigations are being pursued in regard to the survival time and temperature of other viruses and bacteria in milk.

As early as 1892, Sedgwick, Batchelder, and Strauss were advocating the adoption of general pasteurization (*21*), but about 50 years of public health education were required to win over its many opponents, including physicians and veterinarians. World War II had a sizable influence on the acceptance of pasteurization in rural communities in the United States. Even during and after the war, however, there were those who argued that pasteurization was inefficient, that it put a premium on carelessness in milk production, and that it would injure the food value of the milk. It is now estimated that more than 85 percent of the market fluid milk consumed in the United States is pasteurized. In many rural areas, the milk hauler who picks up raw milk also delivers bottled pasteurized milk.

The dramatic disappearance of Pott's disease (tuberculosis of the vertebrae), the precipitous drop in human brucellosis in urban populations, and the decline of other milkborne human diseases, including typhoid fever, summer diarrhea, diphtheria, and streptococcal infections, are self-evident. Pasteurization cannot take credit for all of the decline of those diseases among men, but it has been a sizable factor and in some cases the most important single public health practice. What the full extent of pasteurization may be is not readily answered. In an address before the 1953 meeting of the Southern Branch of the American Public Health Association, Dr. Haven Emerson stated:

"Surely the first and most important contribution to the prevention of acute rheumatic fever and the deaths from valvular heart disease was not the wonderful resource of chemical and antibiotic bacteriostats and bacteriacides, but that wide sweeping enforcement of pasteurization of milk which first made a frontal attack on streptococcal throat infections.

"Without claiming credit for what belongs to the alert and intensive practice of preventive pediatrics and to the general reduction in family outbreaks of hemolytic streptococcus, or claiming that the health officer is responsible for the much milder scarlet fever now common north and south, we must note the not accidental coincidence of a falling acute rheumatic fever death rate among persons under 30 years of age with the consistent enforcement of pasteurization of milk in our large urban populations.

"The better we do our basic sanitation and communicable disease control, the less will internists, cardiologists, and chest surgeons have to do with the heart complications of middle age and later."

It is probable that the overall influence of pasteurization will not be felt for years to come, until there is an opportunity to study a population that has used only pasteurized milk.

Sanitation Practices

To be effective, licensure must be followed up with adequate inspection, and inspection of the premises and practices of all licensed milk dealers and producers is the basis of any milk control program. However, the influence of routine inspection over many years is not readily ascertained. Most milk ordinances require that all milk-producing farms be visited by an inspector at least every 6 months, and once every 3 months or more often is recommended if changes and corrections are being made.

Milk plants and dairies should be checked regularly, and inspections should be made of the water supply, toilets, sewage and manure disposal, and cleanliness of barns, cowyard, milkhouse, utensils, animals, and man. Compliance with sanitary requirements for these items has probably been one of the most constructive steps in rural sanitation and has had a profound influence on public health in rural areas. This

is attested to by the installation of running water, septic tanks, and water heaters in rural homes on dairy farms where some of these items are required.

Summary

One of the chief problems of milk sanitation is the zoonoses which are transmissible to man by contact with milk cows and through milk and milk products. The methods of prevention are: (*a*) animal disease control, (*b*) pasteurization, and (*c*) sanitation. To provide maximum protection of the public against the hazards of milkborne diseases, all of these must be fundamental requirements of any milk sanitation program.

The control of animal diseases can be described as biological control, whereas pasteurization and sanitation constitute physical control. Prevention of animal diseases has a far-reaching effect in that it also prevents occupational disease on the farm and in animal handling industries, increases milk production, and stabilizes animal industry. Pasteurization prevents the transmission of disease by means of milk, but it should not be the only line of protection. Sanitation, especially milk sanitation, is an essential part of any communicable disease control program. When these public health practices are successfully coordinated, a communicable disease control program which has depth as well as practicability results.

The promotion of milk sanitation and communicable disease control is a responsibility of all public health workers, but the veterinarian has the greatest responsibility because of his knowledge of the interrelation of the diseases of man and animal, and their economic and sociologic effects. The coordination of animal disease control and public health practices will result in a more efficient program that will advance public health and human welfare throughout the world.

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A Program for Promoting Mental Health In the Oklahoma Schools

By A. A. HELLAMS, M.D.

AN OVERWHELMING BODY of evidence accumulated during recent years has stressed the importance of the early life experience of an individual in his adaptations to life as an adult. Programs to promote mental health, therefore, may well begin with efforts directed toward persons who are concerned with the training of the child. During the very early years of life, emotional development is fostered primarily by parents. When a child enters school, the teacher, in her day-to-day contact with the child, is in a key position to assist the parents in this phase of his development. If she is cognizant of the basic principles of mental hygiene, the teacher can play an important role in promoting mental health and preventing emotional disturbance in the child.

For the past 3½ years, personnel of the State and local departments of health and education, school administrators, and teachers in Oklahoma have been working together in developing a program which recognizes this important function of the teacher. Through a series of conferences, problems have been defined, objectives established, and recommendations made. Two 2-day workshops and one 2-week workshop on mental health in the classroom have been held for teachers.

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Oklahoma's Approach

The keynote of Oklahoma's activities to promote mental health in the classroom has been the spontaneous development of plans through the cooperative efforts of persons who are constantly working with people with emotional problems: educators, social workers, psychologists, nurses, physicians, and psychiatrists. The progress that has been made and reported by other States in this field has been utilized, but no attempt has been made to adopt a standardized approach or technique.

The initial step to stimulate interest in developing a program was taken by the mental hygiene division of the State health department. In March 1951, the director of the division called together a small group of persons representing the professions of education, nursing, public health, clinical psychology, and psychiatry from city, county, and State departments of health and education. The efforts of the division in bringing significant people together in this and later conferences has been greatly facilitated by the commissioner of health, whose earlier experience as a school teacher gave him a base for contacts in the educational field.

At all times, the personnel of the mental hygiene division have served in a consultant ca-

pacity, maintaining an attitude toward the school authorities of "what do you think we could do to help you?" rather than an attitude of "this should be done." They have recognized that, although they may be specialists in the treatment of mental illness, they do not, by any means, have all the answers to the problem of preventing mental illness.

In the beginning of the program, a special effort was made to orient the school administrators and top-level educators in the importance of mental health concepts in the classroom. Their cooperation and understanding was necessary before the program could be promoted among the classroom teachers. The approach to the teachers has been a give-and-take relationship, a sharing of experiences. The personnel of the mental hygiene division have been willing to learn as well as to share their knowledge about human behavior.

The steady growth of interest in developing plans for the promotion of mental health in the Oklahoma schools can be seen in the following chronological account of the conferences and workshops that have been held. That the progress which has been made is the result of the cooperation and enthusiasm of many persons is evident.

Defining the Problems

At the first meeting in March 1951, three major problems concerning existing practices in the schools were defined:

1. Rigid emphasis on teaching subject matter and factual data in the classroom.
2. A lack of recognition of emotional and physical problems which would retard the child's adjustment and learning.
3. Misunderstanding and lack of cooperation between parents and teachers.

The group selected two teachers to attend a 2-week workshop in Delaware on teaching human relations in the classroom, a workshop conducted as a part of the Bullis project, and to report whatever methods and principles observed that might be adapted to the Oklahoma schools.

The group met for the second time in April 1951 to discuss the reports on the Delaware workshop. Agreeing that the teaching of human relations, whether as a separate course or as part of other courses, is dependent on the training and preparation of the teacher, the group decided to invite a larger number of educators to their next meeting to discuss methods of training teachers.

At the first meeting of the expanded group, the importance of selecting and adequately preparing teachers to conduct courses in human relations was reemphasized. Interest in including a course in mental hygiene in the curriculum of the State teachers colleges and in planning a workshop that would help teachers understand and apply mental hygiene principles was expressed. For improving mental health teaching in the classroom, it was suggested that audiovisual aids be used to stimulate classroom discussion; that manuals or agendas for courses in human relations be prepared for teachers; and that the mental hygiene clinics of Oklahoma City and Tulsa be used for observation and demonstration purposes. To consider further methods of training teachers and to plan for a workshop, a special committee of five—the director of the State health department's mental hygiene division and four school authorities—was selected by the group.

It was announced at this meeting that the Oklahoma City Board of Education had approved the teaching of a class in human relations in one of the city junior high schools. The group suggested that the class be designated as a pilot project, that a record be kept of changes in attitudes of pupils, teachers, parents, and principals and the types of questions and answers developed, and that these data be used in planning projects in other schools. No followup study of this class has yet been made because of a lack of personnel and funds. It has been suggested that a research grant might be obtained if a qualified person can be found to plan and carry out the study.

The interest in mental health in the schools was reflected in the program of the 1951 Oklahoma State Conference of School Administrators. Under the topic "Health Instruction in the Elementary and Secondary School" appeared the recommendation that "the school health instructional program make provisions for meeting the emotional and social needs of children as well as their physical needs." In

addition, a section devoted entirely to mental health in the schools urged the recognition of the importance of mental health in the classroom and recommended that teacher-training institutions give additional training in the study of the normal growth and development of the child, that school administrators make provision for inservice training of teachers along the same lines, and that each school appoint a mental health committee to study the problems in that school and community.

Plans Into Action

By October 1951, plans were completed for the first 2-day workshop for classroom teachers. Sponsored by the State departments of health and education, it was attended by 50 persons, including college presidents, school superintendents, and directors of education, as well as teachers. The program included lectures on dynamic understanding of human behavior, behavior problems and habit disturbances in the preadolescent and adolescent, and normal personality growth and development; reports on five school mental health projects in the United States and Canada; and demonstrations of the use of mental health films as a teaching device.

At the next meeting of the special committee on mental health, augmented by a number of specialists in education, three specific objectives concerning the training of teachers were established: (*a*) better training in the field of mental hygiene in the teachers colleges, (*b*) regional workshops to provide inservice training in mental hygiene for teachers, and (*c*) improvements in teaching techniques in inservice training.

Following this meeting, three special committees were formed to study: (*a*) the teacher-training programs in teachers colleges, (*b*) inservice training programs for teachers, and (*c*) guidance resources for teachers. Two of the special committees announced their recommendations on February 7, 1952.

For the promotion of mental hygiene in the classroom, the committee on teacher education in teachers colleges felt that it was essential (*a*) to evaluate the curriculum and its effect on the mental health of the pupils; (*b*) to consider the personality of the teacher and its effect on the mental health of the pupils; and (*c*) to study methods for selecting teachers or teacher candidates who are stable and well adjusted, for promoting the mental health of teachers by improving their morale through adequate salaries, professional recognition, and pleasant surroundings, and for evaluating the mental health of the teacher through counseling. The committee recommended that a plan for research into these problems be outlined and submitted to a foundation.

The committee on improving guidance facilities stated that the goals of a reorganized guidance program are "to improve existing courses and activities dealing with social skills, the ability to get along with others, self-understanding, personality development, human relations—all of which might be included under the term mental health." The committee reported that human relations courses have been developed in the guidance program in most of the grade schools in Tulsa, El Reno, Shawnee, and Oklahoma City, and in the junior-senior high schools in Ponca City and El Reno. Its recommendations were presented in the form of a long-term plan and a short-term plan.

The long-term plan included these points: (*a*) make available to all teachers a program which reveals the innate nature of development of boys and girls at different ages, allowing for differences in rate of growth, from physical, social, and mental standpoints; (*b*) provide a survey course of principles of guidance to indoctrinate teachers with the necessity of guidance; (*c*) provide a survey course for teachers who feel the need of asking, what can I do to help myself to help this child? (*d*) provide training for administrators, as well as teachers, so that they will be sufficiently conscious of their responsibility in initiating and supporting guidance services.

The short-term plan recommended (*a*) provision of suitable source material at all age and grade levels through workshops or by State supervisors, such material to be provided only until teachers accumulate their own materials to fit the needs as revealed to them by association with students; (*b*) a conscious endeavor on the part of teachers to organize group study programs; (*c*) assistance by the State health department in overt cases of maladjustment; (*d*) education of the public concerning the

program now in existence through newspapers and parent-teacher associations and other organizations.

The second 2-day workshop was held in March 1952 and was attended by 18 teachers from 11 different communities. Group discussion centered around individual differences among children, parent-teacher relationships, and mental hygiene courses in teachers colleges. In the discussion of individual differences, the importance of the teacher's knowledge of background, environment, and personality of each child was stressed. Parent-teacher relationships were acknowledged as invaluable in promoting better understanding and cooperation between the home and the school. The home visitation program was cited as one method of bringing parents and teachers closer together. An educational program for parents was recognized as important, and it was suggested that leaders for discussion groups might be drawn from the professional groups in the communities. It was recommended that courses in mental hygiene be required for all teachers for graduation from the State teachers colleges.

The workshop group was given an opportunity to observe the class in human relations which was being conducted in one of the Oklahoma City junior high schools. They were impressed by the spontaneity of the students and the atmosphere of acceptance and understanding in the classroom. They felt that the success of the course was due to the personality of the teacher and her recognition of the individual differences in her students. Concluding the workshop program was a panel discussion of the role of the teacher from the viewpoints of an educator and a psychiatrist.

As a result of this workshop, three major needs were recognized:

1. A speakers' bureau or pool of resource people in each community to promote an understanding of the emotional needs of children.

2. Consultants and experts to promote concepts of mental hygiene and personality growth and development.

3. Supplementation of college and inservice teacher-training programs to increase the teacher's awareness of the emotional problems of children.

School Administrators' Recommendations

Continued interest in the promotion of mental health in the classroom was exhibited at the Oklahoma State Conference of School Administrators in October 1952. At the sectional meeting devoted to mental hygiene, these questions were considered: What is good mental health? How can we create better conditions for mental health in our schools? What are the administrative responsibilities? How may we recognize serious mental problems and how may we help the mentally retarded? How can the teacher's interest in the dynamics of human behavior be stimulated? The meeting concluded with these recommendations:

1. That each community set up a special group to study its own needs and develop its own plans to promote mental health in the school.

2. That at definite intervals of time representatives from each group meet to discuss their experiences and to exchange information.

3. That information concerning all resource people and material be made available to interested groups, and that information concerning successful programs be made available through the Oklahoma Education Association, the State department of education, and the State department of health.

4. That the teaching of human relations be stressed in all teacher-training programs.

1953–54 Developments

Interest in plans for an inservice training program for teachers, stimulated and expressed at the foregoing meetings, culminated in a 2-week workshop for teachers in July 1953. Held at the University of Oklahoma, it was attended by 88 persons. The teacher and the road to mental health was the theme of the workshop, and the program included lectures, group discussions, and related mental health films, all concerned with the normal stages of personality growth and development.

The workshop was the result of cooperative planning by the University of Oklahoma graduate education and extension divisions, the State departments of health and education, and the Oklahoma Association for Mental Health.

Twenty-five scholarships of $50 each were provided by the State department of health; and 25, by the association.

Tentative plans were made to hold a 2-day conference in Oklahoma City in June 1954, focused primarily on guidance and counseling and limited to psychologists and guidance personnel from the various State colleges. The chancellor of the Oklahoma State Regents for Higher Education, however, proposed an alternative plan. He suggested that a 1-day conference be held at each of the seven major teachers colleges in the State and that all of the faculty and the student body of teachers share in a broad program pertaining to the promotion of mental health.

The latter plan was adopted and carried out. During May, the month before the conferences, the director or the psychiatric social worker of the State health department's mental hygiene division visited each of the seven colleges. From June 2 through June 8, an eminent psychiatrist visited the colleges, addressing the general assemblies of students and faculties and meeting in roundtable discuissions with the faculties and counselors. How to promote more effective teaching of mental health at the college level was the theme of the discussions.

Summary and Conclusions

The program in Oklahoma for promoting mental health in the classroom has been well received. Although no formal plan or method for evaluating the extent to which mental health principles have been integrated in the school activities has yet been devised, teachers and school administrators have reported informally that these principles are being used in teacher conferences, parent-teacher association meetings, and classroom discussions. They have specified that, as a result of the attention given this phase of education, they have become increasingly aware of the individual differences among pupils, of the multiple causes of behavior, and of the importance of interpersonal relations.

Teachers who have had several years' experience in dealing with emotional problems of children are especially interested in furthering their understanding of human behavior. The experienced teacher can better integrate her knowledge of emotional growth and development gained from a workshop on mental health with her everyday experiences in the classroom. Moreover, the experienced teacher tends to be more objective in dealing with emotional problems.

The best methods of communicating the knowledges and skills of any group concerned with emotionally disturbed persons have not been well established. The approach in this program has been for the various groups to share their knowledge, each learning from the other. One of the more successful ways of sharing knowledge about human behavior has been through group discussions. Through the informal interchange of ideas, the knowledge of the specialists in mental health has been used effectively.

Every teacher should be prepared to counsel students, for every teacher can promote mental health by dealing with emotional problems whenever they arise, whether the class is in mathematics, history, or human relations.

A significant influence in Oklahoma's program has been the philosophy that mental health is everybody's business while mental illness is the job of the professional worker. Teachers are not being encouraged to treat emotionally disturbed persons, but they are being encouraged to increase their knowledge of normal behavior and their awareness of deviant behavior as one step toward the prevention of mental illness. The teacher who is well-trained in the principles of mental health will recognize her limitations and will refer the disturbed child to the proper professional services.

The Severity of Poliomyelitis In Multiple-Case Households

By CHARLES I. LEFTWICH, M.D., and JOHN M. CHAPMAN, M.D.

DURING the 1953 poliomyelitis season an attempt was made on a national scale to assess the value of gamma globulin as a prophylactic agent in modifying the severity of illness when administered to subsequent cases among household contacts of a diagnosed case of poliomyelitis. One difficulty in such an evaluation may arise from the occurrence of subsequent cases which are clinically less severe than the case initially recognized in multiple-case households. Moore and Kessell (*1*) have found that, in monkeys inoculated intracerebrally with poliomyelitis virus, decreasing concentrations of the virus produce longer incubation periods. They have also found that as the incubation period is lengthened, illness is less severe. Gard (*2*), working with Theiler's mouse encephalomyelitis virus, obtained similar results. Accordingly, it was decided to examine the relative severity of initial and subsequent cases of poliomyelitis occurring in households during a period when gamma globulin was not available as a prophylactic agent.

Dr. Leftwich, a commissioned officer in the Public Health Service, was on assignment to the bureau of acute communicable diseases, California State Department of Public Health, at the time of this study. He is now chief resident in medicine at the Cincinnati Veterans Hospital. Dr. Chapman is assistant medical director and epidemiologist of the Los Angeles City Health Department.

Methods

Case Records

In the city of Los Angeles for the years 1948, 1949, 1951, and 1952, 130 multiple-case households were identified by matching names and addresses of reported cases of poliomyelitis. No special effort was made in Los Angeles throughout any of the years studied to unearth multiple-case households of poliomyelitis.

In 6 households, either one or both cases were treated at home. All of the cases in the 124 remaining households were hospitalized in the Los Angeles County General Hospital. The clinical records of these cases were used as a source of information for this report. Since not all of the records were available, data were obtained on the cases in 102 households.

Criteria of Diagnosis

For consistency in the clinical diagnosis of poliomyelitis, it was decided to include only the paralytic cases, or, if nonparalytic, only those which had a characteristic history and cerebrospinal fluid findings compatible with a diagnosis of poliomyelitis. Application of these criteria eliminated 20 households.

In the 82 households, poliomyelitis cases are distributed as follows: In 69 households there was 1 initial and 1 subsequent case; in 4 households there occurred 1 initial and 2 subsequent cases; in 1 household there was 1 initial and 3 subsequent cases; in 7 households 2 persons became ill on the same day; and in 1 household 2

persons became ill on the same day, and 1 case occurred subsequently. Because of the inability to differentiate the initial from the subsequent case in the 7 households in which 2 persons became ill on the same day, these households were eliminated from the study. This analysis is based on the 75 initial and 81 subsequent cases in the 75 remaining multiple-case households.

The onset of illness in each case was established as the onset of a continuous illness which led to the diagnosis of poliomyelitis. Through the use of this criterion, it is felt that the interval between onsets of illness of poliomyelitis cases in multiple-case households was consistently determined and thus these cases can be compared.

Measure of Severity

Shortly before discharge from the hospital, muscle examinations were performed routinely on each patient by a physiotherapist. Although the same individual did not perform all of these "checkout" examinations, the method of muscle testing and the recording of results remained the same, and one of two physiotherapists performed most of the muscle gradings. Under the treatment routine of diagnosed poliomyelitis cases at Los Angeles County General Hospital, nearly all patients are discharged to their homes or to a second hospital within 2 weeks following onset. This length of stay has been controlled by Los Angeles City Health Department requirements. Patients were required to remain in the hospital for 2 weeks after date of onset in 1948 and 1949 and for 1 week after date of onset in 1951 and 1952. Accordingly, the discharge (checkout) examination was performed on nearly all patients not sooner than 1 week and rarely more than 2 weeks following onset of illness.

Table 1. Age distribution of initial and subsequent cases of poliomyelitis in 75 multiple-case households

Age in years	Initial cases	Subsequent cases
0–4	38	32
5–9	23	25
10–14	5	7
15–19	1	2
20–24	2	4
25–29	5	3
30+	1	8
All ages	75	81

Table 2. Sex distribution of initial and subsequent cases of poliomyelitis in 75 multiple-case households

Age in years	Initial cases		Subsequent cases	
	Male	Female	Male	Female
Less than 15	44	22	41	23
15 and over	3	6	6	11
All ages	75		81	

In the checkout examination a record was made of the area of the body involved, such as limb, trunk, or neck, and the degree of involvement was recorded as none, slight, moderate, marked, or severe. Bulbar involvement was recorded as either present or not present. The degree of muscle involvement was scored as follows: no involvement was assigned a value of 1; slight, 2; moderate, 3; marked, 4; and severe, 5. No bulbar involvement was graded as 1, and bulbar involvement, as 2. In scoring body areas, neck, trunk, and limbs may be weighted equally or according to muscle mass of the particular area (*3*). Analysis of the data in this report gave similar results with either method. For simplicity, the scoring system that weights areas equally is used in the data presented. With this method of grading, nonparalytic poliomyelitis received a numerical score of 7 (lowest possible score), and poliomyelitis with maximal involvement of neck, trunk, and limbs, plus bulbar involvement, received a numerical score of 32 (highest possible score). Two initial cases received a score of 32 on the basis of death within a few days of onset, although complete muscle examination had not been performed. Since excluding these cases did not alter the results, they were retained in the analysis.

Approximately 40 percent of the cases occurred in children under 5 years of age, and it is well known that examination in this age group is difficult. Because comparisons are made between initial and subsequent cases, and approximately the same number from each occurred in

this age group, there is no reason to believe that the results obtained are biased as a result of including the young children.

In order to obtain larger numbers, paralytic cases are grouped as follows: slight involvement (numerical values 8–13), moderate involvement (14–20), severe involvement (21–32). Cases are further grouped according to the interval between the onsets of the initial and subsequent cases, as noted in the accompanying tables.

Statistical significance was tested by the method of X^2.

Results

Comparisons by age and sex of initial and subsequent cases of poliomyelitis in 75 multiple-case households are presented in tables 1 and 2. It is of interest that of 9 cases occurring in persons over 30 years of age 8 were subsequent cases. There is no difference in the sex distribution of initial and subsequent cases. However, as has been found in other studies (*4*), males were more frequently affected before puberty and females, after puberty.

Table 3 shows the interval between the onset of illness of the initial case and subsequent cases in 82 households. In this series, 61 percent of the subsequent cases occurred within 4 days of the initial case and more than 95 percent within 2 weeks. These results are in agreement with those of Siegel and Greenberg (*5*) and earlier investigations of others (*6*, *7*).

Among 75 initial cases, 57, or 76 percent, were paralytic; among 81 subsequent cases, 47, or 58 percent, were diagnosed as paralytic (table 4). Thus, it can be seen that a greater proportion of paralytic cases occurred among the group of initial cases. This difference between initial and subsequent cases is statistically significant.

Table 3. Interval between onset of illness of initial and subsequent cases of poliomyelitis in 82 [1] multiple-case households

Interval in days	Number subsequent cases	Cumulative percentage
Same day	8	9
1–4	46	61
5–8	22	85
9–12	10	97
13–16	2	99
17–20	1	100
Total	89	100

[1] These 82 households include 8 households in which the onsets of illness in 2 cases occurred on the same day.

Table 4. Distribution of paralytic and nonparalytic illnesses in initial and subsequent cases of poliomyelitis in 75 multiple-case households

Type of illness	Initial cases	Subsequent cases	Total
Nonparalytic	18	34	52
Paralytic	57	47	104
Total	75	81	156

X^2 of this distribution = 4.6; P = 0.03 (approx.).

Tabulated according to the severity of paralysis, 35 of the 57 initial paralytic cases were classified as slight in severity, 17 as moderate, and 5 as severely paralyzed. Among the 47 subsequent paralytic cases, 35 were also classified as slight, and 6 each were considered as moderate and severe paralysis (table 5). Although these differences are not statistically significant, there appears to be a trend toward decreased severity in subsequent cases in a household.

The distribution of paralytic and nonparalytic illness in subsequent cases of poliomyelitis is shown in table 6 according to the interval between the onset of initial and subsequent cases. Among 63 subsequent cases with onset within 7 days of the initial case, 41, or 65 percent, were paralytic; among 18 subsequent cases whose onsets were more than 7 days from the initial case, 6, or 33 percent, were paralytic. This difference in proportion of paralytic illness between subsequent cases occurring 1 week or less after the initial case and those occurring more than 1 week after the initial case is statistically significant.

Table 7 classifies the severity of paralysis in subsequent cases occurring within 7 days of the initial case, and in those occurring more than 7 days from the initial case. Among 41 cases occurring within 7 days, 30 were classified as slight, 6 as moderate, and 5 as severe paralysis. Among 6 cases occurring more than 7 days after the initial case, 5 were considered to be slightly

and 1 severely paralyzed. Although these differences are not statistically significant, there may be a trend toward decreased severity in subsequent cases as the interval between the initial and subsequent case increases.

Table 5. Severity of paralytic illness in initial and subsequent cases of poliomyelitis in 75 multiple-case households

Severity grade [1]	Initial cases	Subsequent cases
Slight	35	35
Moderate	17	6
Severe	5	6
Total	57	47

[1] The corresponding numerical grades, determined as described in the text, are as follows: slight: 8–13; moderate: 14–20; severe: 21–32.

Discussion

This study was performed to test the hypotheses (*a*) that subsequent cases of poliomyelitis are less severe than the initial case in a multiple-case household, and (*b*) that subsequent cases are progressively less severe as the interval between the initial and subsequent case increases. We feel that the data support these hypotheses. From these data and data obtained in the experimental diseases (*1,2*), it might be suspected that infection in multiple-case households is simultaneous and that some of the variation observed in the incubation period and severity

Table 6. Distribution of paralytic and nonparalytic illnesses in subsequent cases of poliomyelitis, according to the interval between the onset of initial and subsequent cases, in 75 multiple-case households

Type of illness	Interval between initial and subsequent case (days)		Total
	1–7	8–20	
Nonparalytic	22	12	34
Paralytic	41	6	47
Total	63	18	81

X^2 of this distribution = 5.5; P = 0.02 (approx.).

Table 7. Severity of paralytic illness in subsequent cases of poliomyelitis, according to interval between onset of the initial and subsequent cases, in 75 multiple-case households

Severity grade	Interval in days	
	1–7	8–20
Slight	30	5
Moderate	6	0
Severe	5	1
Total	41	6

is due to the quantity of virus ingested. Nevertheless, other interpretations of the data must be considered.

For example, in a multiple-case household, the first clinically recognizable case might not actually be the first case; if not, this would suggest that the true first case was mild. Such an event may occur, but probably only rarely, as it was observed only once in over 50 multiple-case households carefully studied during 1953.

Further, after one case is recognized, the index of suspicion is high and subsequent cases, though mild, are more likely to be recognized. This may be a true criticism of the first hypothesis, but does not apply to the second: that subsequent cases of poliomyelitis are progressively less severe as the interval between the initial and subsequent case increases.

Because muscle examinations were performed on patients shortly before discharge, these were not done at the same time in the course of the disease in all cases. Since more severe cases tended to remain in the hospital longer and were examined later in the course of illness, we believe that if such cases had been examined at the same time as the majority (about 14 days after onset), the severe cases would have appeared even more severe. This probably would have made the difference observed between initial and subsequent cases greater and would strengthen the data rather than weaken it.

Information concerning the relative severity of initial and subsequent cases occurring in a multiple-case household is of considerable importance in evaluating a biological product

which may modify the severity of the paralytic illness (*8*). Thus, if subsequent cases can be shown frequently to be milder in the naturally occurring disease, this fact must be carefully weighed in attempting to evaluate the beneficial effect of the biological product.

More such comprehensive studies are necessary, but the present series suggests that any modification of severity of illness in subsequent cases given gamma globulin must be interpreted in the light of what may be observed in families in which no biologic is administered.

Conclusions

In a study of 82 households with multiple cases of poliomyelitis, it has been found that initial cases are more likely to be paralytic than are subsequent cases and that subsequent cases are more likely to be nonparalytic in type as the interval between the initial and subsequent case increases. Possible interpretations of these results have been discussed.

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Since the preparation of this paper, Siegel and Greenberg (9), in a study of poliomyelitis in multiple-case households in New York City, have also found that a higher percentage of nonparalytic illness occurs in subsequent than in initial cases.

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PHR

Estimated Prevalence Of Overweight In the United States

INTEREST in overweight as a health problem has been stimulated by life insurance findings that a relationship exists between overweight and death rates from degenerative diseases. There is no current information for the United States from which estimates of the prevalence of an excessive accumulation of fat in the body can be drawn.

Published estimates of the prevalence of overweight are generally arrived at in terms of a height-weight table. Virtually all height-weight tables widely used in the United States are based on a study reported in 1912 (*1*). For that investigation, data on height-weight relationships were collected on 221,819 men insured between 1885 and 1900, and on 136,504 women insured between 1885 and 1909. From those data, tables were prepared showing average weights for each inch of height for each 5-year age group. The tables of average weights for specific age groups are called standard tables of heights and weights. The study showed differences in mortality rates for a group of these insured persons, classified by excess of actual weight above the average weight for a given height and age. It also indicated the illnesses responsible for the increased mortality among the overweight group.

Since it is recognized that height and weight alone are incomplete indicators of overweight, more recent tables, taking into consideration measurements of build or body type, have been developed by the Metropolitan Life Insurance Company (*2*, *3*). These tables of desirable weights show a range of weights for each inch of height by type of body frame. (Originally called "ideal weight" tables, they are now usually called "desirable weight" tables.) The basic figures for the tables were derived from the standard tables of heights and weights (*1*). These figures, which were arrived at by using the average weight for each inch of height at age 30 for men and at age 25 for women, tend to correlate with the lowest mortality rates.

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Prevalence of Overweight

Four estimates of the prevalence of overweight in the United States are presented here. For this paper, overweight is defined as 10 percent or more actual weight above "standard" or "desirable" weight for the individual.

Impairments Among Insurance Examinees

In 1938, the Life Extension Institute conducted a study of the incidence of impairments among 10,000 life insurance policyholders (*4*). No selection of any kind was attempted. Geographically, those persons examined represented the entire United States.

The group consisted of 3,025 females and 6,975 males aged 10 years and over, who were presumably free from illness and who had not previously been examined by the Life Extension Institute examiners. Overweight in this study meant 10 percent or more actual weight above ideal weight, taking into consideration age and height. Due allowance was made for individual physical type. The weight here is the average weight for 30 years of age, which, according to the Life Extension Institute (*5*), is the ideal weight to maintain throughout maturity. The average weight at age 30 is obtained from the Medico-Actuarial Mortality Investigation (*1*). The table shows that 27.3 percent of the persons examined—25.8 percent of the males and 30.9 percent of the females—were 10 percent or more overweight.

Insurance Company Estimates

According to estimates presented by the Metropolitan Life Insurance Company (*6*), at least 20 percent of the population over the age of 30, or about 15 million persons, are 10 percent or more overweight, and 6.7 percent, or over 5 million persons, are 20 percent or more overweight.

Richmond Multiple Screening Project

In cooperation with the Public Health Service, the Richmond City Health Department con-

Estimated prevalence of overweight in the United States

Race and sex	Number	Persons estimated to be 10 percent or more overweight [1] (percent of population)			Persons estimated to be 20 percent or more overweight [1] (percent of population)		
		Total	White	Negro	Total	White	Negro
		Life Extension Institute Study, July–August 1938 [2] (unselected examinees aged 10 and over)					
Total	10,000	27.3					
Male	6,975	25.8					
Female	3,025	30.9					
		Metropolitan Life Insurance Co., 1950 [3]					
Total	(4)	20.0			6.7		
		Richmond, Va., multiple-screening project, general population aged 15–59, January–July 1950					
Total	33,799	21.4			10.0		
Male	11,574	32.0			13.8		
Female	22,225	15.9			8.0		
White:							
Male	9,017		31.0			12.9	
Female	19,489		13.3			6.2	
Negro:							
Male	2,557			35.6			17.1
Female	2,736			34.4			20.9
		Atlanta, Ga., multiple-screening project, general population aged 15–59, April–June 1950					
Total	182,207	24.8			12.8		
Male	82,043	24.5			10.1		
Female	100,164	25.0			15.0		
White:							
Male	48,474		24.4			9.7	
Female	60,489		15.7			7.7	
Negro:							
Male	33,569			24.7			10.8
Female	39,675			39.3			26.2

[1] The Life Extension Institute study used "ideal weight" (*5*). The Richmond multiple-screening project and the Atlanta multiple-screening project used the standard tables of heights and weights, which were taken from the Association of Life Insurance Medical Directors and Actuarial Society Mortality Investigation, vol. 1, 1912, New York. The Metropolitan Life Insurance Co. used "desirable weight" tables (Metrop. Life Ins. Statist. Bull. 23: 6–8, October 1942; 24: 6–8, June 1943). [2] Proc. Life Extension Examiners, vol. 1, No. 4, July–August 1939, pp. 89–93. [3] Armstrong, Dublin, Wheatley, and Marks: J. A. M. A. 147: 1007–1014, 1951. [4] A personal communication from the Metropolitan Life Insurance Company stated that the estimate of overweight was based upon a variety of sources (see references 4, 7–9).

ducted a multiple screening project in Richmond, Va., from January 30 through July 28, 1950. Height and weight measurements were taken as part of the project. Data are available for 33,799 persons, aged 15–59, who were presumably free from illness. The weight status of each person screened was determined by using the standard tables of heights and weights. It was found that 21.4 percent of the screenees were 10 percent or more overweight and that 10 percent were 20 percent or more overweight. Both groups included a relatively higher percentage of Negro females than of white females. To a lesser extent, this was also true of males.

Atlanta Multiple Screening Project

From April 4 through June 30, 1950, the Atlanta City and Georgia State Health Departments, in cooperation with the Public Health Service, sponsored a multiple screening project in Atlanta. Height and weight measurements were taken, and data are available for 182,207 persons aged 15–59. Standard tables of heights and weights were also used in this study.

It was found that 24.8 percent of the persons screened were 10 percent or more overweight, and that 12.8 percent were 20 percent or more overweight. As in the Richmond study, a relatively higher percentage of Negro females than of white females were overweight. A considerably smaller percentage difference was found when comparing overweight among white and Negro males.

Summary

Made at different times in different locations, the four estimates cited indicate that more than 20 percent of the population of the United States are overweight. The estimates of prevalence of overweight vary from 20 percent to 27.3 percent. Based on 20 percent or more above "standard" or "desirable" weight, the estimates vary from 6.7 percent to 12.8 percent. There was a relatively higher percentage of Negro females than of white females in both the 10- and 20-percent overweight categories.

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Evaluation of Hetrazan As an Anthelmintic In Children

By Mildred B. Gabbard, M.D., Emil Kotcher, Sc.D., and E. D. Pulliam, M.S.P.H.

DESPITE some 40 years of effort to eradicate intestinal helminthic infestation in man, the problem is still one of considerable magnitude in certain mountain areas of Kentucky. The situation has improved, as shown by the data in the accompanying table for Breathitt, Leslie, and Perry Counties. In Owsley County, Ky., however, a survey in early 1952 of 151 children, the majority of school age, revealed that 76.8 percent were infested with *Ascaris lumbricoides;* 56.2 percent, with *Trichuris trichiura;* and 29.1 percent, with hookworm.

Attempts to reduce the incidence of intestinal parasitic infestation in southeastern United States began in 1913 and 1914 with mass treatment programs carried out by the Rockefeller Sanitary Commission for the Eradication of Hookworm. Following a report by Otto and Cort in 1934 (*1*), which showed poor sanitation to be a basic factor in the perpetuation of ascariasis, mass treatment programs largely fell into disuse, and emphasis was given to privy-building campaigns and health education. The studies by Otto and Cort showed that reinfestation occurred within 8 months to 1 year if sanitation and sanitary habits were not improved.

For the past 20 years, sanitarians have worked diligently at convincing property owners to construct satisfactory fecal disposal systems, but, even when construction has been provided free, the programs have not been entirely successful because some families could not afford the cost of the materials. And even when sanitary facilities have been constructed, use has not been made of them in many instances because of cultural habits.

Dr. Gabbard, regional medical consultant with the Kentucky State Department of Health since 1953, was health officer of Lee and Owsley Counties, Ky., when the study reported here was made. Dr. Kotcher, now on leave of absence to serve as public health laboratory consultant with the United States Operations Mission in Vietnam, has been associate professor of microbiology at the University of Louisville School of Medicine since 1947. Mr. Pulliam was engaged in communicable disease control work with the Kentucky State Department of Health during 1952 and 1953 and is now supervisor of the department's home accident prevention section.

Coordinated Attack

In order to impress the families in Owsley County who had high infestation rates for hookworm and *Ascaris* with the need for better sanitary facilities, a coordinated attack on the problem was decided upon: treatment, health education, and privy construction.

Stool examinations of 396 school children were made to determine what parasites were present, and a vermifuge was given to the persons found infested. Instruction on the life cycle of intestinal helminths and their pathological capabilities was given to school children and to a few adult groups. Finally, the families were contacted and advised as to their sanitation needs, and they were offered aid in constructing privies and other sanitary facilities.

The compound 1-diethylcarbamyl-4-methylpiperazine dihydrogen citrate (Hetrazan) was selected as the vermifuge because it is relatively nontoxic and because *Ascaris* was the most prevalent helminth. Reports by a number of investigators on the efficacy of this drug as an ascaricide have indicated cure rates varying from 33.3 percent to 80 percent (*2–9*). The differences could be attributed to variations in the dosages and regimens used in treatment, variations in the fecal examination techniques

and time intervals employed in determining cures, variations in the age of the patients in the study groups and in the number of patients in each group, or, possibly, variations in the strains of *A. lumbricoides* found in different parts of the world.

In view of the varied results and procedures associated with this drug and the possibility of differences in strain susceptibility, it was decided to collect data on the efficacy of the drug as it was used in the Owsley County program. The study was sponsored by the department of microbiology, University of Louisville School of Medicine, and the Kentucky State Department of Health. It was supported in part by the Medical Research Grant of the Commonwealth of Kentucky.

Examination and Treatment Methods

The first group in Owsley County treated with the drug consisted of 81 white school children, a few of whom were less than 6 years of age. The following dosages of the drug with water were given to the children at the school during the school day (6 hours): one 100-mg. tablet 3 times a day for 5 days to children aged 1 through 6 years; two 100-mg. tablets 3 times a day for 5 days to children aged 7 through 10 years; and three 100-mg. tablets 3 times a day for 5 days to children over 10 years of age. The student's daily routine was not interrupted in any way except for the actual administration of the drug. Fecal specimens were examined by zinc sulfate flotation and direct smear techniques before treatment and 1 to 2 weeks after treatment.

A second group from the same county consisted of 68 white school children. Each child in this group was given 12 mg. of the drug per pound body weight in 3 divided doses the first day. When toxic symptoms appeared among some of the children, the dosage was decreased to 6 mg. per pound of body weight, and this amount was administered in 3 divided doses each day for the next 4 days. Feces were examined before treatment, 2 to 3 weeks after treatment, and again 3 to 4 weeks after treatment, using the same techniques used for the first group.

The toxic symptoms probably would not have appeared with the 12-mg. dosage if the 3 doses could have been given at 6-hour intervals instead of at 3-hour intervals, for the few children who were given doses at home did not show such symptoms. Since the vermifuge had to be administered during the 6-hour school day, the smaller dosage became necessary.

The vermifuge did not kill the worms. It started a churning action inside the child, and in some instances the worms were vomited and in others they were expelled by way of the rectum. All the children got excellent results, some of them passing as many as 80 to 100 worms after one treatment.

Comparison of *Ascaris* infestation rates in selected counties of Kentucky, prior to 1921, in 1928–30, and in 1950

County	Prior to 1921 [1]		1928–30 [1]		1950	
	Number examined	Percentage positive	Number examined	Percentage positive	Number examined	Percentage positive
Breathitt	1, 871	34. 6	872	68. 3	212	32. 5
Leslie	2, 492	70. 6	824	67. 0	479	17. 7
Perry	2, 197	54. 1	934	33. 2	376	25. 0

[1] Reference 1.

Examination Results

According to examination of fecal specimens from the first group of children before treatment, all were infested with *A. lumbricoides;* 68, with *T. trichiura;* and 33, with hookworm. Post-treatment examinations revealed that 34 (41.9 percent) of the children were negative for *Ascaris* ova; 27 (39.8 percent of those infested with *T. trichiura*) were negative for *Trichuris* ova; and 2 (6.6 percent of those infested with hookworm) were negative for hookworm ova.

Post-treatment examination of the children in the second group, who received somewhat larger doses of the drug than the children in the first group, showed that 36, or 52.9 percent, were negative for *Ascaris* ova in their feces 2 to 3 weeks after treatment. Only 18, or 26.5 percent, of the children in this group, however, were negative 3 to 4 weeks after treatment. Not enough of the children in the second group

were infested with *Trichuris* or hookworm for evaluation of the efficacy of the drug on these helminths.

Evaluation of Results

The difficulty of evaluating precisely an anthelmintic drug when it is administered to ambulatory patients is recognized. The possibility that the positive results of examinations made even 1 to 2 weeks after treatment represent reinfections must be considered, although the possibility is very remote. This study, however, was made specifically to determine whether or not Hetrazan is a safe and useful drug for treating school children at school, and the results were evaluated on this basis.

The results obtained in Owsley County in cases of *T. trichiura* and hookworm infestation are comparable to those reported by Hoekenga in his Honduran studies (*8*). The drug has relatively little effect on the hookworm, and it is not a very efficacious compound against *T. trichiura*, although the percentage of cures among the children infested with this helminth was much higher than the percentage among the children infested with hookworm.

The results obtained in the cases of ascariasis indicate that post-treatment examination of the patient should be at an interval greater than 2 or 3 weeks. It appears that the drug may merely suppress egg production, as indicated in the report by Oliver-Gonzalez and his associates (*2*), and not eradicate the worm. (Many of the children, however, did pass worms, as noted above.) It is quite probable that many of the children in the second group who were negative in the first post-treatment examination and positive in the second examination were so because egg production had been suppressed by the drug. Hoekenga (*9*) commented on this suppressive effect in his Honduran studies.

Although the drug used in this study does not compare favorably with other drugs in its ability to cure a high percentage of cases of ascariasis, it does have the advantage of being less toxic. It does not cause mucosal burns of the mouth, and the patient is not required to fast and to undergo saline purgation before taking it. Further studies should be made to determine whether several treatments, at monthly intervals, with a smaller dosage of this drug or a single treatment with a larger dosage over a longer period of time will effect as many cures as more efficacious compounds.

Summary

A campaign against intestinal helminthic infestation in Owsley County, Ky., included treatment of infested school children with 1-diethylcarbamyl-4-methylpiperazine dihydrogen citrate (Hetrazan), health education, and aid in constructing sanitary fecal disposal facilities.

When given in amounts of 6 mg. per pound of body weight in 3 divided doses for 4 days, the drug caused elimination of *Ascaris lumbricoides*. The early favorable results, as determined by examination of feces during the second and third weeks after treatment, were appreciably lessened when examinations were performed during the third and fourth weeks after treatment, the percentage of "cures" decreasing from 52.9 to 26.5.

The drug had some effect in eliminating *Trichuris trichiura*, but much less effect in eliminating hookworms, as indicated by post-treatment examination of feces for ova.

EDITOR'S NOTE: The use of the trade name Hetrazan in this paper is for identification only and does not represent an endorsement of the drug by the Public Health Service. Hetrazan was supplied by Lederle Laboratories Division, American Cyanamid Company.

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Sanitation in the Construction Of Modern Trailer Courts

By J. B. THOMAS

AN ESTIMATED 2 million people now use trailers as permanent or temporary living quarters. In all, 83,000 trailers were manufactured in 1952; 62,000, or 74 percent, were built with 2 bedrooms, living room, kitchenette, and complete bath. These mobile units are now used as homes by construction workers, retired persons, and families of men in the military services. Trailers are also used extensively for vacationing.

Public health authorities are concerned with the general sanitation of trailer courts and the health hazards which develop in courts not designed or maintained to serve this transient trade adequately. Since trailers travel all over the country and across our national borders, they offer a rapid mode of disease dissemination. Inadequate water supply, sewage and waste disposal, and insectborne and rodentborne disease can create health hazards which must be considered in the construction of trailer courts. The number of trailer courts regulated by health authorities has not increased in proportion to the number of mobile units in use. Many sanitation problems occur in trailer parking sites not under regular inspection by local or State health departments.

Several years ago a number of State health departments and representatives of the trailer industry asked the Public Health Service for help in developing sanitary standards and recommended regulations for trailer courts. Early in 1953 the Public Health Service released a pamphlet, Trailer Court Sanitation With Suggested Ordinances and Regulations (*1*). One of the industry's trade associations assisted in the printing of this publication and in its distribution to the industry.

Mr. Thomas, an engineer with the Region III office of the Public Health Service in Washington, D. C., is assigned as consultant to the Office of National Capital Parks, National Park Service. He participated in the designing and reconstruction of the trailer court in East Potomac Park, Washington, D. C.

The Hains Point Court

Such interest was shown in trailer court design and construction that the Office of National Capital Parks, a field agency of the National Park Service, and the Public Health Service became concerned with conditions at the trailer court in East Potomac Park, Washington, D. C. This is the only trailer court within the District of Columbia, and it is part of the Potomac Park Motor Court. It is located on Federal land controlled by the Office of National Capital Parks and is operated by Government Services, Inc., a concessionaire.

A survey of the sanitary conditions in the original court by the superintendent of the Office of National Capital Parks and his en-

gineers, in company with the Public Health Service consultant assigned to that office, resulted in a decision to reconstruct this court as a model trailer court. Existing conditions were such that it was deemed advisable to make immediate improvements of all facilities. It was further agreed that the building of a court with all modern facilities in the Nation's Capital would greatly assist in promoting improvements in other courts throughout the country. With the assistance of the Public Health Service, it was possible to have all planning and reconstruction adequately supervised and to observe the most modern standards for all sanitary facilities.

A portion of the new court with service building in background. Small fenced-in enclosure is for refuse cans.

Planning the Reconstruction

A local architectural firm was employed by Government Services, Inc., and planning of the new court began in the fall of 1952. The architects, working with the engineers of the Office of National Capital Parks and the Public Health Service consultant, sought to provide not only an attractive court with modern sanitary facilities, but also proper and adequate everyday services such as refuse collection and yard maintenance.

The planning of the new court required more time than might have been considered normal because of the lack of information among the architects, engineers, and mobile unit manufacturers on details of construction which would meet the basic requirements of a modern trailer court serving all types of mobile units. Other problems involved in the planning included the preservation of 24 large trees and the perimeter roadway.

Public water and sewerage facilities were accessible, and sufficient electric power was available. The service building originally provided to accommodate the dependent trailers with lavatory, toilet, and laundry facilities was situated in the adjacent motor court area just outside the limits of the original trailer court, where it could easily serve occupants of the new court. This made a service building in the new court area unnecessary.

Numerous layouts were studied in an effort to provide the maximum possible number of parking spaces without removing any of the trees and providing adequate depth for parking trailers up to 45 feet in length. Angular parking was determined to be the most satisfactory for the economic utilization of the area, the convenience of the trailer owner in parking, and the appearance of the court.

The selected layout provided 56 trailer spaces for which individual accommodations would have to be provided. The spaces varied in size, but averaged 25 x 40 feet, or 1,000 square feet each. Some variation in width was necessary to keep the trees within the sodded, curbed areas where they would not interfere with roadways nor be too close to the mobile units.

Automobile parking space was provided in the area between the court's perimeter roadway and the shrubbery which screened the entire court. This arrangement was agreed upon as it met fire regulations regarding the spacing of car and trailer and prevented the cluttered appearance found in many trailer courts, where the parking of cars adjacent to the trailers is permitted.

For the many overnight visitors, provisions were made to park without uncoupling cars from trailers. This was accomplished by building a new roadway the full length of the 2-acre tract, dividing the court into two sections. On one side of the new roadway, parking spaces long enough to accommodate car and trailer without uncoupling were constructed. These drive-through parking spaces were open at both ends to facilitate the entry and exit of overnight visitors.

The other section formed by the new roadway provided sufficient area for a double row of angular spaces designed for backing in trailer units and uncoupling the tow cars.

Since the existing court had not been planned to serve modern trailers, it was necessary to remodel completely this entire court in order to comply with safety regulations governing the spacing of mobile home units and tow cars and to provide the required ventilation for all units. Water, sewer, and power connections were essential if the court was to serve the trailer coach of today.

The service curb.

Service Connections

Following a study of the requirements of modern mobile units and numerous meetings with representatives of the industry, it was agreed that certain additions to recent basic recommendations of the Public Health Service (*1*) were desirable to attain the objective of a model court for the Nation's Capital. The service curb was one such important addition.

The service curb is located on the left (driver's) side of each mobile unit parking space. The curb serves as a guide in parking at any hour of the day or night and provides adequate protection for connections to water, sewer, and electricity. Many modern trailers have been equipped with television sets by their owners. A vertical pipe sleeve placed in the central section of the service curb provides a support for television antennas. This small addition permits all antennas to be uniformly located and avoids the use of hazardous guy wires.

In addition to these merits, the curb, with its definitely located services, should assist in promoting standardization of the location of all connections on the various types of mobile units and result in simplified, efficient, and sanitary connections for all mobile units.

Since freezing weather occurs in the District of Columbia and winter visitors are numerous, frostproof water connections were necessary. To eliminate any possibility of back siphonage in the frostproof hydrant, all weephole bleeds were connected to a return waterline and pump. The return waterline provides a closed system and extends to a pump at the service building, where the water is discharged by way of an air gap into a plumbing fixture within the building. This method of hydrant drainage provides a complete, protected system whereby the frostproof hydrant can be used at any time without danger of its freezing. The occupant of the trailer must, however, furnish his own electrical heating tape to prevent the water-service line from hydrant to trailer from freezing.

Careful attention was given to spacing of the water and sewer lines. All sewer services were brought to the service curb from one side and water service from the other. Lateral mains were laid lengthwise of the court at least 10 feet apart. These mains extended from existing mains in the perimeter roadway. Fire hydrants located on the 6-inch mains at each end of the court are within the required 400-foot distance of any trailer.

Sewer connections were carried in 4-inch terra cotta pipe from the 6-inch main to the service curb, where a 3-inch running trap and a 3-inch riser of cast iron were installed. The 90° L at the ground surface was fitted with a threaded brass ferrule where the pipe terminated in the face of the service curb. A brass plug anchored by a chain was provided at each sewer connection so that these openings can be closed when not connected to a mobile unit. The present threaded ferrules provide for 2½-inch connections; however, 3-inch threaded connections can be provided should the need arise. With suitable adapters, it is possible to make satisfactory watertight sanitary connections with any mobile unit parked in the court.

In designing the electrical connections, allowance had to be made for both large and small

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mobile units with varying load requirements of refrigerators, radios, television sets, air-conditioning units, and many other appliances. All wiring was placed underground to avoid the unsightliness of poles. Unsightly meter boxes also were eliminated by the use of a metered feeder. The only poles permitted in the court area were those for street lighting, which were of attractive design. Individual 30-ampere circuits supplied current to each space with 2- and 3-wire cords and waterproof outlets. Separate load centers were located at various service curbs throughout the court. These load centers were so placed that no mobile unit would be more than 50 feet from its circuit breaker. All outlets and locked circuit-breaker boxes are adequately protected from damage by being located in the center of the service curb.

Refuse Storage and Collection

Refuse collection services were already provided in the adjoining motor court. Extending this service to the new trailer court was a simple matter. However, adequate storage facilities were necessary for both garbage and rubbish, which had to be collected separately. For appearance and durability, as well as for simplicity in cleaning, racks for the garbage cans were built with concrete pedestals and were enclosed in metal fences. These metal fences have a removable side. The lid of each can is chained to the fence. This assures the lid's availability at all times to protect the contents of the can from flies, abate odor nuisance, and also avoid excessive damage to the lid by its being thrown around on the ground. A frost-proof hydrant, as previously described for the individual trailer spaces, was provided at each rack. A waste-water drain to the sewer is provided at each hydrant, and the pedestal is sloped to drain so that the entire refuse-can area can be easily hosed down and maintained in a sanitary condition. This hydrant also provides water for general use and for hose connections for lawn sprinkling.

Approval and Construction

Final plans were completed in December 1952, and work was started on the reconstruction of the court in January 1953. Since the Public Health Service had worked directly with all concerned in the planning of the court and since it was to be constructed by a Federal agency, approval of the plan by local health authorities was not necessary.

The low elevation of the area and heavy spring rains retarded construction and delayed the reopening of the court. After ground construction was completed, including wiring, storm sewers, and storm water-catch basins, and the concrete for the service curbs was poured, the roadways were resurfaced and unpaved areas were sodded. The paving and sodding were completed by the middle of August, and the court was officially opened for occupancy on September 1, 1953.

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Transmission of Virus Encephalitides

The present list of encephalitides, or viruses producing encephalitis, from the Americas includes western equine encephalomyelitis, eastern equine encephalomyelitis, St. Louis encephalitis, California, Ilheus, *Anopheles* A, *Anopheles* B, *Wyeomyia*, *Anopheles* I, Sabenthine I, an unnamed virus from *Psorophora ferox*, and Venezuelan equine encephalomyelitis. The first four occur in North America and the others in Central and South America. At present, the first three and the last of the encephalitides listed constitute health problems.

Public Health Monograph No. 23 attempts to summarize information on the relation of insects and arachnids to the transmission of viral encephalitis in the Americas. It is a handbook featuring tabulations based on reference data, including results of attempted virus isolations from arthropods in nature; results of attempted direct, and indirect, virus transmission by bite of an arthropod; results of testing naturally infected warm-blooded hosts for neutralizing antibodies in their serums; results of tests to find encephalitis virus in warm-blooded animals in nature; an index of various candidate virus hosts used in laboratory studies; and historical highlights. Data have been collated from 433 subject papers. The period covered extends through April 1952.

Varying significance is attached to the vector-borne virus encephalitides as a public health problem in American countries. In Central and South America, health authorities continue to be concerned with outbreaks of "sleeping sickness" among equines and usually related cases of encephalitis in man. Mosquitoes are highly suspected as disease vectors there since several encephalitogenic viruses have been isolated from them, including etiological agents found in jungle species. In the Caribbean area extensive outbreaks of encephalomyelitis among Cuban horses were reported for last year. The disease has an endemic status in the Dominican Republic, where it attacks both equines and man.

In those portions of the United States where

Public Health
MONOGRAPH

No. 23

The accompanying summary covers the principal findings presented in Public Health Monograph No. 23, published concurrently with this issue of Public Health Reports. The author is a public health parasitologist at the Public Health Service's Communicable Disease Center, Atlanta, Ga. He is at present engaged in schistosomiasis research at the center's Puerto Rico Field Station, San Juan.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch, Public Health Service. Copies will be found also in the libraries of professional schools and major universities, and in selected public libraries.

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Ferguson, Frederick F.: Biological factors in the transmission of American arthropod-borne virus encephalitides. Public Health Monograph No. 23 (Public Health Service Publication No. 372). 37 pages. U. S. Government Printing Office, Washington, D. C., 1954. Price 30 cents.

irrigation agriculture is practiced on a large scale, and in areas where very extensive acreage is planned for such usage, epidemic encephalitis has become a significant regional health problem. The chief indicted mosquito vector of encephalitis in western United States, *Culex tarsalis*, thrives in waste waters attendant upon poor irrigation methods, as well as in a variety of other places. The present range of the vector species covers principally those States west of the Mississippi River—a range coincident with the irrigation belt. Thus, with the decline in malaria as a health problem, epidemic encephalitis has emerged as the most significant presently active mosquito-borne disease in North America.

In the United States the present distribution of the three important types of encephalitis virus—eastern, western, and St. Louis—in mosquitoes, in warm-blooded host animals, or in man is discontinuous geographically. Mortality from these diseases in the United States has ranged from 5 to 60 percent. At present encephalitis has a relatively low endemic status, in horse or man, but can rapidly become a problem of public alarm in certain States, such as California, where vast sums of money are expended annually in attempts to reduce mosquito production.

It would seem that continued research in the epidemiology and ecology of encephalitis in selected irrigated areas of western United States would be most productive of information of value to public health organizations. Another region worthy of investigation is the Caribbean where viruses are active in mosquitoes which are produced the year round, and where outbreaks in equines and man may be expected with a fair degree of regularity. For example, since eastern equine encephalomyelitis is endemic in the Dominican Republic, information obtained there by sustained investigations may aid in solving problems of transmission of this strain in the United States.

There are no problems satisfactorily solved with respect to the epidemic encephalitides in the Americas. A concerted effort by epidemiologists, clinicians, and medical entomologists will undoubtedly continue for many years before the problems of encephalitis control and vector containment are solved to the benefit of public health.

Roswell Park Memorial Institute Adds New Wing

A new $9.5 million wing at the Roswell Park Memorial Institute in Buffalo, N. Y., was opened October 14, 1954, expanding the State's facilities for research into the causes, treatment, and cure of cancer.

Maintained by the New York State Department of Health, the institute has as its purpose an integrated attack on the problem of cancer through basic research, clinical laboratory research, clinical investigation, and patient treatment. Being planned are laboratories for basic research in the fields of biochemistry and biology.

To be eligible for admission, a patient must be a resident of New York, must be suspected of having or known to have a malignant or premalignant lesion, and must be referred by a New York physician. During 1953, diagnostic and treatment services were provided for approximately 23,406 patients. The expansion will permit the admission of a greatly increased number of patients.

technical publications

VD Fact Sheet

Public Health Service Publication No. 341. December 1953. 21 pages; tables.

Designed to serve as a ready source of basic statistics on venereal diseases in the United States, this publication presents data on trends in venereal disease incidence and prevalence for the past several years that are indicative of the results of the control program. Other statistics include the estimated annual costs of uncontrolled syphilis, loss of life expectancy due to syphilis, mortality and insanity due to syphilis.

The information is current as of December 1953 and supersedes any previously published data.

A Better Chance for Mental Health for Children in Smaller Communities

By Robert H. Felix. (Public Health Service reprint from The Child, vol. 16, No. 9, May 1952.) 10 pages; illustrated. 10 cents.

The need for mental health clinic services in a complete child health program is emphasized in this pamphlet, but it advises that such services are not the only available means by which a community can help its children toward mental health. Numerous common "subclinical" difficulties often can be handled by parents, teachers, physicians, public health nurses, social workers, and other local people—if these individuals have a basic understanding of mental health concepts.

In some cases, when children present problems that call for intensive diagnostic study, the smaller community can make arrangements to secure clinic services from a traveling clinic team, either from a nearby university or the State mental health agency. In some instances the community can arrange to send children to a nearby guidance clinic upon referral by a physician or by an agency.

This article outlines ways of bringing mental health to the attention of professional people and the public through speeches and discussions in meetings of professional societies, civic and service clubs, and church groups; mental health workshops; radio scripts; plays designed for amateur presentation; and mental health films.

The Nurse in the United States Public Health Service

Public Health Service Publication No. 361. Revised April 1954.

The opportunities available to a graduate nurse for a career in the United States Public Health Service are discussed in this booklet. Two ways of obtaining a position—by civil service appointment and by appointment to the commissioned corps—are described, with requirements of each outlined.

The publication tells of the nurse's place in the Public Health Service hospital and field activities and of the many opportunities offered for broad experience and continued education in health activities. The workweek, leave regulations, promotions, transfers, and retirement benefits are discussed.

Well-prepared nurses with supervisory and teaching experience, the pamphlet points out, are sought for nursing and educational assignments abroad—in Latin America, in the Near East, Middle East, and Far East, in Africa, and in southeast Asia—to assist the peoples of the underdeveloped countries in establishing and improving their own health programs. In many instances of foreign assignment, special allowances augment the regular salary.

The 16 Public Health Service hospitals, their location, type, and bed capacity are listed in the booklet. A short description of the opportunities offered to the nurse at the Clinical Center at Bethesda, Md., is also included.

The Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio

Public Health Service Publication No. 354. 1954. 18 pages; illustrated.

Briefly defined in this pamphlet is the scope of the problems being studied at the Robert A. Taft Sanitary Engineering Center. A history of the center is given and its present activities and technical services are described. The facilities of the center are outlined and a description of its standard laboratory unit is supplied.

Identification of Some Internal Parasites of Laboratory Animals

Public Health Service Publication No. 343. 1954. By Robert T. Habermann, Fletcher P. Williams, Jr., and William T. S. Thorp. 29 pages; illustrated. 20 cents.

This publication is designed to assist in readily identifying internal parasites of laboratory animals so that measures may be taken to rid the animals of their parasites before being used in experiments. It notes that parasitism is often difficult to diagnose because of the injury produced by the parasites and the accompanying chronic diseases and malnutrition.

The authors have based their evaluations of the anthelmintic treatments on clinical and critical tests made on National Institutes of Health animals, including mice, rats, guinea pigs, rabbits, monkeys, cats, and dogs. The direct smear method and the salt flotation centrifuge

technical publications

method for diagnosing parasitism in individual animals are described. The composite sample technique, also described, is recommended to determine the kinds of intestinal parasites in cages of laboratory animals.

For each of the various parasites—roundworms, tapeworms, protozoa, coccidia, ascarids, and others—the morphology, life cycle, pathology, incidence, diagnosis, control, and treatment are outlined.

Photomicrographs are shown of actual cases of parasitism and of helminths obtained at necropsy.

An Industrial Waste Guide to the Milk Processing Industry

Public Health Service Publication No. 298. 1953. 14 pages; illustrated. 15 cents.

As in many other industries, control and disposal of wastes are a major concern of the dairy industry. Optimum utilization and reduction of wastes are essential for economic production; wastes which cannot be eliminated must be disposed of in a manner that will protect the Nation's limited water resources for maximum use.

The first of a series of Industrial Waste Guides to be prepared by the National Technical Task Committee on Industrial Wastes for the Public Health Service, this guide is intended primarily to aid operators of milk processing and handling establishments to utilize, reduce, and otherwise suitably dispose of their wastes. The guide includes descriptions of the various processes and raw materials used in the industry and its products. Sources, quantity, and composition of wastes are discussed. Methods for utilization of dairy byproducts and for waste saving are outlined. In cases where waste prevention and byproduct recovery are not sufficient to prevent stream pollution, methods of waste treatment are suggested. A bibliography on milk wastes is appended.

The guide was prepared by the Subcommittee on Dairy Waste Disposal of the Dairy Industry Committee. It was submitted to the Public Health Service through the dairy industry representative of the National Technical Task Committee on Industrial Wastes.

The Role of the Police in Mental Health

Public Health Service Publication No. 360. 1954. By Rhoda J. Milliken. 5 pages. 5 cents.

The police, because of their duties, have an opportunity to make a real contribution in the mental health field. In juvenile delinquency cases, the arresting officer may help the young person gain in understanding from the experience, or increase his hostility toward the community. This leaflet discusses what the police can do and are doing in many communities to help. A list of pamphlets and films on juvenile delinquency, understanding children, and special problems are included.

Instructor's Guide—Sanitary Food Service

Public Health Service Publication No. 90. Revised 1953. 209 pages; illustrated. $1.50. (Also issued as joint Army, Navy, and Air Force publication TM 8-525/NAVMED P-1333/AFM 146-7.)

This revised manual—designed for health departments and management to use in training food-service personnel in the principles and application of safe food service and published originally in 1946 as the Guide to Safe Food Service—coordinates the experience and knowledge gained since the publication of the first edition with the old tried and true.

The manual gives to the instructor an improved method of instruction and a new approach to better human relations. The principles of training employed have been proved valuable by extensive practical field trials. The comprehensive bibliography and detailed guides for utilization of training aids make the manual adaptable to any teaching situation by offering many choices from the audiovisual field. Each instructor should tailor his training course to the specific needs of his group.

Although the manual likely will not meet all individual training problems or contain all necessary technical data needed in the field of food sanitation, it is expected to serve a variety of purposes: State and local health departments can use it as a basis for training food-service personnel; State and local distributive education specialists will find it useful in conducting classes in food service and sanitation; divisions of the armed services concerned with the prevention of foodborne disease will find it a valuable guide in organizing and conducting classes for military food-service personnel; and owners and managers of eating and drinking establishments can use it for their in-service training programs.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

The Child Health Conference

clientele
values
limitations

Analysis of the socioeconomic characteristics of families using the Long Beach Department of Public Health child health conferences and an evaluation of the conference functions and services.

By LONIS LIVERMAN, M.S.W.

CHILD HEALTH SERVICES have received special attention throughout the world and more particularly in the United States within the last few years. This emphasis seems to result from the increasing awareness that "the biggest business in the world . . . is the business of rearing children" (*1*).

Since the child health conference is one of the principal facilities through which child health services are provided, it has been the focus of much of this attention.

The child health conference, dating back to the early years of this century, covers a wide range of services—the traditional functions of periodic physical examinations, immunizations, and feeding instruction for the infant and preschool child and individual instruction for parents in the normal, physical, emotional, and social growth of the child as well.

In the conference, however, the continuity of medical care is broken because the child is cared for by one physician when he is well and another when he becomes ill. This is one of the criticisms of the conference (*2*).

Discussion has also centered on the nature of the services that should be provided (*3*, *4*). And a difference of opinion has been expressed about the economic segment of the population that the child health conference should serve (*5*, *6*).

The conference program provided since 1948 by the Long Beach Department of Public Health in California was studied to find answers to some of the questions that have been raised about child health conferences.

Information was sought on four areas related to conference services: (*a*) the segment of the population served; (*b*) the relationship of child health conference services to the medical care obtained for children; (*c*) the benefits the families believe are derived from attendance; and (*d*) the extent to which the parents' needs are met.

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The Long Beach Conferences

The Long Beach Health Department program has expanded to seven conferences, each held

weekly in the city's more heavily populated areas. The basic staff of each conference consists of 1 physician, 2 public health nurses, and 2 or 3 volunteers recruited through the parent-teacher association. The health department's psychiatrist and medical social worker are also available for consultation.

Services are provided without charge for children from birth to school age in families meeting the financial eligibility requirements. The frequency of the physical examinations range from monthly for the infant to yearly for the healthy 4- or 5-year-old.

Supplementary services are provided by the public health nurse, who extends conference care into the home. Upon completion of the physical examination, the nurse reviews the physician's recommendations with the mother, making sure that they are understood and can be carried out. When conditions requiring treatment are discovered, the family is helped to find appropriate medical care. The mother may also use this opportunity to talk with the nurse about problems concerning herself, the child, or the family situation. When indicated, the nurse makes a followup home visit to talk further with the mother about problems raised during the discussion at the conference. The nurse adapts her health teaching to the needs and educational background of the family. She demonstrates procedures of child care and helps the mother to understand the child's growth and development, giving reassurance and emotional support to the mother in her handling of the child.

The public health nurse determines the family's eligibility for service. If the child is not under the care of a private physician and the family is unable to pay for health supervision under private auspices, a conference appointment is made. Financial eligibility is determined on a budget basis. Periodic evaluations ascertain continued eligibility. When income warrants, the family is helped to plan for health supervision under private auspices, and the children are discharged from the conference.

On April 1, 1952, 753 families were registered in the Long Beach conferences. Of the 1,364 preschool children in these families, 1,213 had attended a conference.

The preschool children reached represent a roughly estimated 17 percent of the city's children potentially eligible on the basis of financial status alone. According to 1950 census figures, Long Beach has 23,163 preschool children, and 34 percent of the city's families have yearly incomes of less than $3,000 (*7*). Thus, allowing 1 preschool child to a family, at least 7,875 preschool children come from families living on $3,000 a year or less. Actually, there are probably more because of the inverse ratio of number of children to size of family income (*8*).

Characteristics of the Study

In the study, the records of the total conference population, 753 families, were reviewed, and 20 cases were selected at random for more intensive study involving an interview with a parent. Except for very low incomes and larger-than-average households, the families registered in the conferences appeared to be representative of families in the community. The characteristics of the sample families were compared with those of the total conference population with respect to racial distribution, household composition, housing, income distribution, and conference attendance. This comparison revealed close similarity in percentage distribution in all but two categories—housing and length of attendance.

Of the families interviewed, 42.2 percent lived in single unit houses, while only 32.6 percent of the total families had this type of housing. A greater difference was noted in the type of expenditure made for housing. In the sample group 31.6 percent were purchasing homes compared with 13.9 percent of the 753 families.

In length of attendance, 63.2 percent of the families interviewed had attended for more than one year, while only 48.9 percent of the whole group had used the conferences for this period of time.

It is recognized that use of percentages with reference to 20 cases, 2.6 percent of the total conference population, may be misleading. However, use of percentages allows a comparison of the characteristics of the sample families with those of the total families. Since the sample appears to be representative, some tenta-

tive conclusions drawn from it may apply to the larger group as indications of areas in which further study is warranted.

Population Segment Served

Long Beach is an industrial community and a naval center. It has a population of approximately 251,000, weighted in the older age group and predominantly Caucasian. Eleven percent of the residents are 65 years or over, and only 2.6 percent of the population is nonwhite (*7*). While most of the families known to the conferences were white, an unusually large proportion, 27 percent, was nonwhite compared to the small nonwhite population in the city. This proportion was possibly influenced by the location of some conferences in Negro residential areas, by the special problems confronting Negroes in getting health supervision through private resources, and by the satisfaction Negro mothers got from conference services.

With few exceptions the conferences dealt with typical family groups. Of the total conference population, 606 families were composed of both parents and 1 to 3 children; 481 of these families were made up of the parents and 2 or more children. Conference families came from the city's low-income group, which was to be expected since there are financial eligibility limitations on attendance. Seventy-seven percent of the conference population had incomes of less than $3,000 per year. Few families met the Bureau of Labor Statistics budget for a "modest but adequate" standard of living (*9*). Most of the families lived in low-rental areas. Slightly less than 80 percent lived in rented houses, and more than 40 percent of the families rented apartments in government housing projects.

Conference services appear to have been focused on the infant and young preschool child since 72 percent of the children registered in the conferences were under 3 years of age. Some questions are raised by this information. The years between the ages of 3 and 5 are recognized as one of the most important periods in a child's development and a taxing time for parents (*10*, *11*). During this period parents may need considerable help in understanding their child and his growth patterns. One wonders then, why so few children in this age group were seen in these child health conferences. Is it because of lack of staff and facilities to meet the need? Or can it also be that conference personnel are still focusing on the traditional services of immunization, physical examination, and feeding instruction rather than gearing the services to provide guidance for parents in the social and emotional growth and development of their children as well?

If it is true that the conferences reached only 17 percent of the potentially eligible preschool children, one might ask why such a small percentage of those potentially in need actually received these services. Would this situation also be related to lack of staff and facilities to meet the need? Do people who could use the services know about the conferences? Can other ways of disseminating information about the conferences be discovered and used?

These are particularly significant questions in view of the limited sources of referral to conferences revealed in the interviews. More of the families learned of the services through friends and relatives than through any other source, although public health nurses and community agencies were other sources of referral. It was not the purpose of this study to answer these questions, but they appear to warrant further consideration.

Relationship to Medical Care

An attempt was made to obtain information that would be useful in evaluating whether the families saw supervision of the children's health as a part of their total medical care. In discussing the relationship of child health conference services to the medical care obtained for the children, only 1 of the 20 mothers interviewed mentioned an exchange of information between the conference and the facility giving sick baby care.

Nine of the mothers interviewed said they would prefer to consult the same physician for both medical care and health supervision. In spite of this fact, however, only four of these mothers said they would obtain health supervision through a private physician if they could afford to do so. Ten mothers expressed a pref-

erence for child health conference care, cost notwithstanding. All 10 made statements which indicated that they were more comfortable in the conference setting, and 2 mothers also based their preference on the nature of the care. They believed that the conference staff gave them more time and had more personal interest in them than was true of the private practitioner's office.

The discussion about conference services revealed some possible reasons for this apparent contradiction. Only two of the families had ever obtained child health supervision privately, and both had been forced to discontinue for financial reasons. All of the mothers believed private health supervision to be out of their financial reach. Thus, it is reasonable to assume that there may have been an element of rationalization in their statements. On the other hand, they made it clear that the atmosphere of the conference was an important determining factor in their preference for this setting, and the services of the auxiliary personnel of the conferences were obviously of great importance to many mothers.

A less tangible factor that may be significant in influencing mothers' attitudes toward medical care is the difference in the emotional content of a well baby visit from that of a visit to a medical facility, where illness is the primary concern. Many people still associate a visit to the doctor's office with all of the fear, anxiety, and pain that it often means. Ordinarily none of these feelings is associated with a child health conference appointment. The mother is not only quite free of anxiety for her own child, but she is not likely to have her security threatened by another mother's worries as is often the case in a sick baby clinic or the physician's office.

There is no evidence that can be used in evaluating whether this viewpoint is really a significant factor or how significant it might be in influencing attitudes toward medical care. It seems to warrant consideration, however, and if there is validity in this thinking, it might be well to consider adjustments in the ways in which health supervision is offered in private medical offices at this time. It might be possible to utilize some of the positive factors in child health conference services in private pediatric care.

Another, more immediate, need is pointed up here. Participants in the provision of child health services, including parents, agree that both health supervision and medical care would be more effective if they were not separated. One wonders, then, if they need be as dissociated as they are, even as they are provided now. Apparently there is need to evaluate the effectiveness of lines of communication between child health conferences and the facilities which provide medical treatment for children, including the offices of physicians in private practice. It might be possible to devise some method of unified recordkeeping. For example, the physician might be able to use the information in the baby book kept for the mother by conference personnel in order to fill gaps in his knowledge of the child's growth and development. He might, in turn, record significant medical findings in the same book for the use of conference personnel.

Benefits Derived From Attendance

As was to be expected, the traditional functions of the conference were among the first to be mentioned in discussing conference benefits. Almost all of the mothers interviewed gave the physical examinations and immunizations as important reasons for bringing their children to the conferences. Their comments revealed, however, that these services were important, not for themselves as much as for the reassurance and support they offered. Other studies have commented on this need for reassurance as a factor in conference attendance (*12*). There are several reasons why it is so important to mothers. Many young women are frightened at the responsibility of caring for a small baby. They feel uncertain about their ability to recognize and handle difficulties with the baby, and they cannot rely on guidance from their parents the way young people were formerly able to do. Concepts about child care have undergone many changes within the last half century. Young people can no longer trust the old familiar ways, and they are insecure with the new. Mothers stated these feelings in different ways. The following excerpt from one interview illustrates how one mother expressed it.

Mrs. Victor said that the conference had been especially valuable to her in helping her to apply to her baby and the way he grows the knowledge she obtained from books and articles. She did not depend on conference staff for detailed instructions, but when the clinician assured her that it was all right to start feeding the baby a new kind of food, she felt able to plan variations in his diet. She said this was her first baby and she wanted to do things properly. She feels fairly capable of taking care of him, but she guessed she needed a little reassurance that she was doing all right and that there was nothing the matter with him. It gave her confidence when the doctor told her the baby was healthy, and confirmed her methods of caring for him.

All of the mothers interviewed expressed appreciation of the services given by conference personnel. It was apparent that they had confidence in the professional ability of the staff. But beyond this, the pleasant, friendly atmosphere of the conference was also of great importance to them. They sensed that this was a place where motherhood and children are held in high esteem, and they responded to this regard. The impartial, personal attention given each mother was important to all of them, but it had special significance for Negro mothers. All six of the Negro mothers interviewed mentioned, in particular, that they enjoyed their conference experience because they were so well received. They appeared to recognize and place value on the fact that here the measure of success and status was based on competence in rearing children, independent of race or financial or social position.

The services received from public health nurses were especially important to the mothers interviewed. They appreciated the nurses' extension of conference service into the home and accepted it as evidence of interest in them and their problems. Several young mothers with first babies commented in particular about the valuable guidance they received from the public health nurse. A warmth of feeling between the mother and the nurse was revealed in most instances. The following excerpt from an interview describes the way in which one mother was helped.

Mrs. Davidson's principal reason for attending the conference was because it reassured her to know that the baby was well. This meant that she was doing things right and not neglecting her baby. She also believed the immunizations were important, but not the most important services to her. She mentioned how pleased she was when the public health nurse called at her home after the baby was born. She had no idea that anyone outside her family would be interested in helping her with the baby.

Twelve of the mothers interviewed indicated that they enjoyed the group experience their conference appointments afforded them. Their comments revealed that the conference provided a setting conducive to thoughtful consideration of the children's problems and ways of meeting them. They indicated a desire and readiness for group counseling in the area of child rearing. A number of writers have suggested that group methods may be applicable and useful to supplement the usual child health conference services (*13–15*). Such counseling requires special knowledge and skill, however, and in the absence of trained group workers, it would seem important to provide training opportunities for staff members who indicate interest and ability to acquire these skills before undertaking such a program.

Criticisms of conference service were related primarily to the physical settings: crowding, confusion, and long waiting periods to see the clinician.

To make the services described here qualitative and satisfying to mothers, adequate staff and sufficient time to spend with each patient are necessary. It is the opinion of some that the experienced physician, working with known patients, should average 15 minutes per patient, particularly in the field of anticipatory guidance (*16*). It is equally important that other specialists working with the family, such as the public health nurse or medical social worker, also have sufficient time with each patient to make the contact a meaningful one.

Needs of Parents in Child Rearing

One purpose of this study was to evaluate the extent to which the parents' needs in the area of child rearing were being met. To discover the difficulties with which families believed they could use help, the interviewer described the social casework services provided in some child health conferences.

This problem-solving process provides methods of helping people understand what is caus-

ing their problems and how to meet them. The caseworker helps the troubled person discover within himself, his family, and his community the resources necessary to deal with the difficulty confronting him. According to Cockerill and others (*17*), the casework process involves three interrelated steps, study, diagnosis, and treatment, and is carried on in the light of certain guiding principles and with reference to knowledge of human behavior, social experience, and social institutions.

The mothers were asked if they could see value in having such help available. If so, they were asked to give examples of the ways in which they could use the service. Fourteen mothers said they would like this assistance and described how they would use it. Difficulties such as sibling jealousy, disciplinary problems, enuresis, and toilet training were cited.

There were also less specific problems with which mothers indicated a need for help. These included disagreement between the parents over the children, preparation of older children for the coming of a new baby, and differences between siblings in terms of behavior patterns and reactions—areas of service that are not unique to the field of social casework. The public health nurse also gives assistance with these problems. In any program in which the two professions, medical social work and public health nursing, work cooperatively it is essential that they plan together for the services that each will give. To be effective this planning must be based on mutual understanding of function (*18*).

The situations described by conference mothers, however, indicated a need for the special skills of the social caseworker. In some situations the caseworker's ability was needed to help parents understand and deal appropriately with a child's negativistic or aggressive behavior. In other instances her recognition of the danger of premature or inappropriate reassurance, as it may block the parent in revealing the real nature of the difficulty, was indicated. In nine cases the content of the interviews and the interviewer's observations in the home revealed social and emotional problems which the conference staff would not ordinarily deal with because the problems were not "within the normal range of parental difficulties" (*15*). Recognition of such problems requires trained and sensitive observation since they will often be concealed beneath superficially simple concerns.

Ideally, the needs described by the mothers interviewed would be met by the health department social worker. It is hoped that the day when this will be possible is not too far off. Realistically, few health departments have a sufficiently well-developed social service unit to extend these services on a complete coverage basis. Therefore, it is necessary to evaluate ways in which existing services can be used to meet the needs as fully as possible. By participating in the inservice training of conference personnel, the medical social worker could help sharpen their skills in recognizing social and emotional problems that should be referred to other sources of help and in assisting families to make use of such help. Existing social service units can also be consulted on ways in which to meet difficulties such as those described, and they can accept for service limited situations in which casework treatment is indicated and appropriate to the function of the conference.

Other Implications of the Study

Information obtained from the 753 conference records revealed a significant incidence of health problems among these families. Further study in this area seems indicated. It might be helpful to know the nature and extent of illness among the families attending child health conferences and the effect of illness on the family's economic status and on the emotional atmosphere in the home. In 9 of the 20 families interviewed relatively severe emotional problems were apparent. Two mothers expressed concern about the unfavorable effect their own behavior might be having on their children's behavior. One mother had a history of severe illness and radical surgery. At the time of the interview she was fearful of a recurrence of symptoms, but she had not sought medical attention. She realized that she was impatient and sharp with the children and that they responded with irritating and hyperactive behavior. The other of these two mothers gave a history of psychiatric hospitalization as a child. She appeared to be a tense and nervous

person, and there was evidence of tension between her and the two older boys.

Two mothers gave evidence of being overanxious about their children. One was a young mother with her first baby born after 6 years of marriage. She voiced severe standards for the upbringing of her child, and the interviewer received the impression of frugal and rigid parents, apparently determined to provide what is best for their child but doing it sparingly, almost grudgingly. The other mother was 40 years old when her second child was born, and her first child was 12 years old at the time. The period prior to the baby's birth was an emotionally traumatic one, culminating in her separation from the baby's father. She had suffered a severe nervous reaction and was a tense and anxious-appearing person. She expressed many concerns about the baby and about her relationship with the older child.

One mother was concerned about whether the mental illness in her husband's family was hereditary. His mother and two sisters were in mental hospitals, and she expressed a need for help in knowing how to handle her daughter so that she would not contribute to the possibility of mental breakdown in her. One young mother believed her child's temper tantrums were due to the fact that she had "marked the child" prior to its birth. An unmarried mother was worried about the effect her situation would have on her son, and she wondered how and when she could explain it to him so that he would understand.

Two mothers described unsatisfactory relationships with their own parents, and in the discussions revealed how this was affecting their present parent-child relationships. One mother was deeply concerned about an older daughter who suffered from what she implied was a hereditary personality disorder. During one visit the interviewer could observe that the children were fearful of physical punishment from their mother, who seemed unduly strict with them. Even the 8-month-old boy put up his arms to shield his face when she spoke sharply to him. There were multiple problems in this family aggravated by conflict between the parents on how the children's difficulties should be dealt with.

It is difficult to evaluate whether this high incidence of emotional problems among the families interviewed indicates an interrelationship between economic stress and emotional upset in these families; whether there is more emotional distress among "average" families than is generally estimated (*8*); or whether the conferences tend to attract anxious mothers who seek reassurance. In any event further study is indicated to determine the need and opportunity for a preventive mental health program.

One of the limitations of this study is that it has explored only the needs of those families who requested service and were able to meet financial eligibility requirements. It might be of interest to study the needs of families who requested service and were found to be ineligible to learn whether they were able to get these services through other resources; and if not, what prevented them from providing the children with this necessary care.

Summary

The majority of the 753 families in the Long Beach Department of Public Health child health conferences came from the city's low-income group, lived in low-cost rental areas, and was made up of families composed of the parents and two or three children. Most of the families were white but a large percent were nonwhite compared to the small nonwhite population in the city. Most of the children, 72 percent, registered in the conferences were under 3 years of age, and only a small percentage of the families potentially eligible were utilizing the services.

Little cooperative exchange of information between child health conferences and facilities providing medical treatment for children was known to the mothers interviewed. Mothers recognized the disadvantages of this separation of services and expressed a desire for unification of child health supervision and medical care. Further study to improve lines of communication between conferences and treatment facilities seems indicated.

In discussing conference benefits the mothers interviewed almost invariably mentioned the physical examinations, immunizations, and feeding instruction as having importance for

them. Their discussions, however, revealed that the reassurance these services offered was a more important factor in attendance than the services themselves. Mothers also mentioned the services of public health nurses as being especially valuable to them, and the pleasant, friendly atmosphere of the conferences was disclosed as a significant factor in conference attendance.

Fourteen of the mothers interviewed expressed a desire for social casework help. In describing how they would use it, difficulties, such as sibling rivalry, toilet training, and family conflicts were cited. It is recognized that public health nurses also give help with such problems, but those presented by the mothers were of such nature that the special skills of the social caseworker were indicated. Review of the 753 family records revealed a significant number of health problems among these families. The content of the interviews pointed up a high incidence of emotional distress among the families interviewed. Further study might bring clarification in this area.

Some changes in focus and staffing patterns appear necessary in order to meet the obligations incorporated in the newer concepts of child health supervision. Special training opportunities for conference staffs seem advisable so that services can be geared more toward providing guidance for parents in dealing with "the normal, everyday problems in the growth and development of children" (*19*). The addition of medical social casework to conferences seems indicated, on a direct service basis when possible, and at least on a consultation level. The way is open to provide additional preventive mental health services and group counseling in the conferences when trained personnel are available to give these services. It is essential that the various professional disciplines who have a contribution to make to the health and welfare of children work together in providing their services.

It seems that in Long Beach, Calif., the child health conferences are meeting a community need, and expansion of the program is indicated to make the services available to more of the families who might be able to use them. It may be advisable to use new ways of disseminating information about conference care.

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What is the clinic patient learning? Is it good, or is it negative? Within the existing framework, can that learning be made more effective?

Health Education for Outpatients

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WORKERS in hospital outpatient clinics have an unusual opportunity for health education. People who come to the clinic do so because they have a health problem. It is of real concern to them. And the clinic is where they expect to get help. What takes place in the clinic can be more meaningful educationally than academic discussions or lectures about healthful practices at times when people are not actively concerned about their health.

There is an analogy between health education and medicine. Medicine is the art of applying the basic biological sciences for the benefit of the physical health of the individual. Health education is the art of applying an equally basic body of knowledge about the ways in which people acquire information, develop attitudes, and change their behavior about health.

Health education requires diagnosis of the particular situation before methods are chosen just as medicine requires diagnosis before treatment is prescribed. However, there is a tendency for some to choose an educational method that has proved successful in a particular situation for which it was designed, on the assumption that it is generally effective in all situations. This same tendency is sometimes observed in medicine. A dietitian tells this story:

One of the older physicians on the staff had ordered an extremely high fat diet for a diabetic patient. A week or so later, diet orders with a very high fat content came down to the diet kitchen for two other diabetic patients. Thinking there must be some good reason for this deviation from the hospital's usual practice, the dietitian went up to the ward to inquire. The new intern said in surprise, "Oh, are those diets unusual? Why, I just ordered what old Dr. Brown had prescribed for the last diabetic patient he had here." As it turned out, Dr. Brown had put his patient on a ketogenic diet during the hospitalization period for a special reason. In routinely following the other physician's prescription, the intern had unknowingly prescribed diets which were not appropriate for his patient's needs.

Such a procedure would, of course, be condemned by the experienced physician who thinks about the whole organism when a patient complains about a single symptom. In good

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education, too, the whole range of educational principles must be examined in order to select the best methods for a particular purpose.

How People Learn

It may be beneficial to take a look at some of the basic knowledge about how people learn before exploring ways of educating patients in clinics. Part of it will be familiar—some ideas have been recently documented by research, others are "educated hunches"—but application of the following five points is well worth all the emphasis that can be given.

First, all learning is motivated within the person, not by exterior force. Education in the real sense begins only with a problem of immediate interest to a person. The patient in the clinic has some problem of present concern to him, or he wouldn't be there. Thus, a condition favorable to learning already exists in the patient. Is maximum use made of this opportunity?

Beyond that immediate interest, people are truly motivated to do only those things which they think help achieve something they want or help cope with their own special personal problems. These goals may not be clear to the individual or to the person working with him. As a matter of fact, they are likely to be unrecognized by either. Nevertheless, they are the determining factors in what is learned in a given situation. Learning takes place more effectively when the experience has meaning for the learner, and he is able to see the full implications of the experience.

Second, learning is an active process. It occurs only through the person's own efforts. So long as he is passive toward a situation, he will learn little. Yet, how often are people "told" what to do, lectured about tuberculosis or cancer, handed leaflets about health subjects? How often does the patient's "Yes, Doctor," or "Yes, Miss" response to the information given him delude the clinician into thinking the patient is learning? Sometimes there has been real interchange of ideas, but at other times the patient's assent is simply to free himself from an undesirable situation or to prevent exposing his lack of understanding.

Third, a person selects what he sees, hears, or feels largely because of both his past and present interests or motivations, and this selection determines what he learns. Furthermore, what is learned and how it is learned differ from one person to another because each comes into a given situation with a unique background of experience and point of view.

For example, three people walk down the street past a poster announcing a chest X-ray schedule. The man who wants an X-ray will see the poster and go to the clinic. The man who thinks he has no need for an X-ray may not see the poster at all. The third person may see the poster all right but will avoid the clinic because of negative feelings about all clinics, because he is afraid of tuberculosis, because he has had a recent X-ray, or for other reasons.

The response to a simple poster arises out of complex feelings. Consider then the tangled skein of past experiences. These enhance or hinder his ability to utilize the educational opportunities in the clinic.

Fourth, behavior is seldom changed because a person has been told to do something different. He will change his behavior in a prescribed manner only when he understands what to do and when he sees the action as leading to the satisfaction of a felt need. He must want to learn the new action. He must also know clearly what action he is to take. Finally, he must see that the action will help him achieve a goal that is important to him. This characteristic of the learning process is particularly important in the outpatient clinic. How often information is given in medical terms that mean nothing to the patient! Besides that, the patient may not readily understand that the behavior advocated by the nurse or physician is related to the solution of his own health problem. He may then remain unconvinced that the procedure will cure his ailment.

It is important for the clinic staff to remember that the patient is not likely to carry out any suggested action to meet his health need which to him appears to be in conflict with his way of life. The fact that the advice is acceptable to the person giving it often blinds that person to the ways in which the information may conflict with some deeply held value of the patient. This failure to consider the personal element sometimes defeats the clinician's goal.

Fifth, the attitudes of the groups to which the patient belongs are a significant force. Most people tend to conform to the accepted standards and sanctions of family and friends. These may determine whether information is accepted or rejected and whether the person takes any action. It is often difficult to recognize many of these group influences because they may be unrealized by the patient himself. The factors which appear on the top layer often camouflage the real values held tenaciously underneath.

One expression of the way group pressures operate is through the cultural patterns of the people. These patterns are not readily discernible, and the assistance of educators and social scientists will be needed to discover the cultural medium in which a patient lives if it is to be used with insight in his education.

Current experiments with new research methods are providing additional perceptions about cultural reactions and their relation to learning. Although the full meaning of these studies is not quickly understood, and the facts are apt to be forgotten since they do not agree with prevailing concepts, it is desirable to look at some of the recent developments in the field because their significance has often been overlooked.

Stratified Attitudes

Studies on class stratification in the United States show a society made up of fairly well-defined classes (*1*). These studies agree, too, that: (*a*) each class has different values in which it believes and which it preserves, and each has different attitudes toward education; (*b*) each class tends to reject people who are in another class; and (*c*) members of each class have different ways of managing their own lives.

The class system of this country is not like that of the European countries. It is distinctly our own. Most professional people in medicine and the allied fields are drawn from the middle and upper-middle classes. Most middle-class people think that what they believe is the common belief of all right-minded, intelligent people. This attitude trips up many educational efforts. It results in annoyance and leads to the comment that people are uncooperative, stupid, hostile.

Not everyone in the United States regards infant life, health, life, or death the way this middle class does. Nor will everyone learn easily to change behaviors regarding health and medical care unless these changes are behaviors valued by the group to which he belongs. People who are in one social class do not accept easily the teaching given them by a person from a higher social class. More respect must be accorded the varying resistances of the different cultures in our society.

Most of our observations of the expressions of cultural values are empirical and tinged with unconscious prejudgments. Only a few studies which get at this kind of fact have been done in the health field. One which deserves thought was done recently at the Veterans Administration Hospital (West Kingsbridge Road) in New York City (*2*). This study attempted to pin down the effect of cultural differences in patients' responses to pain.

Among the groups selected for intensive study, the Italians and Jews were described as tending "to exaggerate" their pain. Free expression of words, sounds, and gestures is expected, accepted, and approved in both Jewish and Italian cultures. A patient from an Italian culture is more apt to be concerned with the present. If his pain is eased, he will relax and forget his sufferings and manifest a happy and joyful disposition. The Jewish patient, however, is often reluctant to accept the analgesic drug. He explains this in terms of concern about the effects of the drug on his health. He is apprehensive about the habit-forming aspects. After being relieved from pain, many Jewish patients continued to display depressed and worried behavior.

The conclusions of this phase of the study were two:

Similar reactions to pain manifested by members of different ethnocultural groups do not necessarily reflect similar attitudes to pain.

Reactive patterns similar in terms of their manifestations may have different functions and serve different purposes in various cultures.

From this, there would seem to be practical implications for education. First, there is not

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a public of patients, but many groups within the total patient clientele. Also, there is no quick way to bring about changes in behavior within these different groups.

Many of the symptoms which bring people to clinics are life crises—social and emotional as well as physical. A mother concerned about a new baby, a breadwinner recovering from a heart attack, a family adjusting to the diagnosis of cancer in a member—these are real life situations. At such times, barriers to learning are lowered. However, life crises produce many anxieties, and the patient may raise barriers to learning if the approach appears to be too great a threat to his goals of personal security.

The fact of having to admit illness, for the most part, threatens the familiar image of the patient's own successful ways of meeting life. Illness calls into play unaccustomed responses. The patient is more apt to worry about the unfamiliar. He has to ask for help, and these feelings about seeking help can be charged with guilt. Staff members may share emotionally charged feelings about seeking help or dealing with illness. Their inner judgments affect the inflection of voice and physical gestures. These become cues to which the patient reacts favorably or unfavorably, raising or lowering his defenses accordingly. In fact, what the patient perceives is just as potent a force in his education as the planned instruction during a lecture or individual conference.

For an educational program to make the most of its opportunities, the clinic staff must seek more knowledge about, and be willing to accept the worth of, patients' values and knowledge. There are two kinds of educational opportunities in a clinic that may be considered against the background of educational principles— the ones you plan for and the ones you don't, or opportunities for indirect and direct education programs.

Indirect Education Programs

A thoughtful objective look at what goes on in the clinic will indicate some of the instances and situations in which unplanned education occurs. What does the patient see? What is he made to feel?

What the patient learns depends on the clinic atmosphere—its climate. An inquiry into its physical makeup is a good starting point. For example: To what extent has the staff impersonalized the hospital-clinic routine? Must the patient sit in brown and dingy corridors? Does someone explain to him what he is to expect and why; and, is he prepared to spend the time required? Is the unit aware of what the wait means to the patient; and, is the patient uncertain while he waits?

Uncertainty creates fear, and fear is apt to produce anger which, though it may be expressed in many ways, often appears as resentment or apathy. When there is vagueness about the details of therapy, it is perfectly normal for the patient to imagine the worst. He will cooperate more readily when he knows about routine matters.

A public health nurse tells about the time she was suddenly taken ill while on her vacation. The hospital physician she called urged her to come to the outpatient clinic. There she had to wait a long time, feeling more and more miserable. Finally, she was vaguely aware of a stiffy starched nurse advancing toward her and carrying a hypodermic needle. The strange nurse told her to get up on the table in the cubicle "over there." It was only because of her hospital training that the public health nurse questioned this command. As it turned out, the physician had had an emergency call. He had been sure from the patient's description of her symptoms that penicillin was indicated and had left an order for it to be given.

In this instance, it was particularly fortunate the patient spoke up—she knew she was sensitive to penicillin. But what might some other patient, not a nurse, have learned about medical practice from such vague experience, so unrelated to his own understanding of cause and effect and expectations of medical service? And what kinds of feelings would such patient transfer to the next situation? Simple thoughtfulness will reassure a patient, make him less demanding and more ready to hear the advice of the staff. It will make a positive health education experience the more likely.

The Physician's Role

The medical director can set the stage in which real education occurs, or he can defeat

the opportunity for education. Among other studies bearing this out, the Denver study of tuberculosis hospitals (*3*) shows that the organization of a hospital often does not encourage sufficiently free exchange of information between various professional services. When the barriers are down, so that there is a pooling of information concerning patients, all benefit. It is the medical director who creates the climate in which this can happen.

The position which the physician holds in the patient's regard is the rock upon which treatment succeeds or fails. If the patient is given the feeling that the physician is interested in him personally, he is able to utilize other aspects of the medical care much more adequately. This was seen in Boston in the diabetes education program sponsored by the Diabetes Field Research and Training Unit of the Public Health Service. How the physician referred the patient to the group classes made a difference in the patient's willingness to come to the classes and to accept the information given by the nurse and nutritionist throughout the 8 weeks' session.

The staff's perception of how it feels to be a patient will be increased by each member's participation in situations which parallel those experienced by the patient. There is a growing trend to plan situations for the staff in terms of the conditions in which patients find themselves so that they can better understand how it feels to be a patient. Many a hospital routine has been changed by wise physicians or nurses, after they themselves have been real life patients. It is not possible to, nor would one wish that every person could, have the experience of being a patient. Accumulated knowledge, however, attests the contribution to patient care and education of contrived experiences which develop insight.

At Boston Psychopathic Hospital, staff members are offered an opportunity to take a drug which can create in well people for approximately 24 hours the feelings which a schizophrenic patient experiences. This sensitizing experience is not possible or necessary for all of the hospital staff. But it illustrates the idea of devices by which one may become more sensitive to a patient's feelings. Staff members have also tried role-playing of "how it feels to be a patient" and are enthusiastic about the usefulness of this technique. There was a health department, too, which changed its entire procedure for handling telephone reports of communicable disease after the role-playing of "what happened on a call about a suspected diphtheria case." Another technique might be to have young medical students get the "feel" of clinic processes by going through a clinic identified only as a patient.

The Patient's Response

It saves time and makes for effective education to know the patient's opinion. After all, the patient acts on his own opinion whether it is correct or not. A simple well-planned interview with the patient usually will obtain the necessary information. When patient opinion is known, it is possible to plan an educational program which will hit the target more accurately.

Most patients realize that they are not competent to judge medical care, but they become impatient when their wishes and ideas are ignored. Their progress toward recovery and in education can be delayed by rules and procedures they do not understand and by indifferent personnel. Positive education is not apt to occur in a discontented person. Many people lose their dissatisfaction when they realize that the clinic is sufficiently interested in them to find out what their opinion is. One study of patient opinion found that most satisfied patients complained about not having the hospital schedule explained (*4*). Is this worth exploring in outpatient clinics?

The interviewers in this same poll were startled by one complaint which may have significance for outpatient clinics. Patients who were generally well satisfied did not feel that they had received enough information about how to care for themselves at home. The poll-takers concluded that "it was evidence of the failure of nurses and doctors to seize opportunities for health teaching; as well as showing a lack of interest in the patient as a person who will continue to exist and have health problems related to his illness even after he leaves the hospital. It could show, too, a lack of integrated planning with allied health agencies for followup care."

Direct Education Programs

The "diagnostic" process (*5*) of telling people things is not the most successful or satisfying way of working educationally with them—it is often dangerous, and its effect cannot be foreseen. It would seem preferable to adopt the "therapeutic" process of helping people to recognize things for themselves. However, since many shared attitudes are derived from the teacher-pupil experience of academic life, the attitude that one educates people by doing things to them is carried over into, and dominates, the educational relationships to patients. The difference in the diagnostic and therapeutic processes is between doing things "to" or "for" people and doing things "with" them. These ways of thinking affect the indirect and direct education that is done.

Printed literature, exhibits, and information racks are useful tools in an educational program, but the extent of their effectiveness depends on thoughtful planning for their use. The Veterans Administration Hospital in Rutland Heights, Mass., used to give packets of pamphlets on tuberculosis to every new tuberculosis patient admitted. They lay untouched on the bedstands. However, when racks were put in the wards where the men could make their own selections, pamphlets began to disappear, in considerable variety and number.

Another, and even more significant use of health literature, is that reported by Schwartz (*6*). The Cornell University Medical Center outpatient department in New York City started using pamphlet racks with a wide range of subject matter. Some of the staff were cynical.

Why child guidance leaflets in an adult clinic? they asked. Who on those benches requires prenatal care? A glance would show that the average age is 60. But patients waiting on outpatient benches, like people everywhere, have families. They did not discard family problems or interests at the clinic door, and the pamphlets disappeared.

The educator was still not satisfied, and another approach was tried. This time only one copy of each leaflet was made accessible. It was clearly marked "Please do not remove this booklet from the clinic. If you think a copy will help you, talk with the nurse about obtaining one." These pamphlets were mixed with copies of the *Saturday Evening Post* and other magazines. To the surprise of the clinic staff, there were 136 requests for the leaflets in the first 4 weeks. Pamphlets in hand, the patients came and asked for information. The conferences which followed brought to light all manner of problems not directly related to the patient's reason for coming to the clinic. Transfer to physicians of information important to the treatment of the individual patients was a valuable result.

Advising and planning with patients and their families on what to expect in connection with medical therapy can produce favorable educational results. The study on hospitalization of children for tonsillectomies (*7*) conducted by the Albany (N. Y.) Medical College Department of Pediatrics is an example of such anticipatory planning. Among other things, this study showed that young children resented a jab with a hypodermic needle. The child was told that the only jab he had to take was the finger prick for a hemoglobin reading. The staff found that if young Philip knew in advance that his finger would receive a slight prick, such as he gets dozens of times playing, followed by the appearance of a round bead of his own beautiful red blood, he was likely to watch without anxiety while the bead of blood rose in a little glass tube, just as he had been told it would. Mother might stand by trying to keep from shuddering, but Philip was fascinated. This is health education of real significance.

Any number of people, given the opportunity, will welcome the chance to help with the clinic's education program. It is not at all necessary for the clinic to do it alone. If mimeographed maps or guides to the clinic routine are needed, volunteers can solve the problem. If the staff is too busy to take time to talk with foreign-born folks who struggle with English, the local adult education center may be able to supply volunteers from its foreign language classes.

If time will not permit inservice education of staff, a plan used in Boston may be the solution. There, 9 hospitals and 11 official and voluntary agencies set up a committee on outpatient education to plan ways for improving educational practices. Educators are members and suggest

improvements for the staffs to try. Other services for which the hospital clinics do not have time to recruit independently are provided in other ways.

Volunteers provided the Lubbock Memorial Hospital in Lubbock, Tex., with pamphlet racks and kept them filled; they also provided transportation for the indigent. While doing this, they learned about another need and have helped the hospital develop a Negro prenatal clinic. Now, they are working on community understanding of welfare problems which affect the hospital. Thus, a double educational goal is being served. Not only are the patients in the hospital learning, but the volunteers have discovered many opportunities for effective action.

Group activities is one of the more significant methods that can be used by clinics to provide learning opportunities. This method is being tried in a wide variety of situations. Group discussions with parents in child health conferences at the Lillian Wald Health Station in New York City (*8*), group discussion with parents and families of premature babies and of children with rheumatic fever at Grace-New Haven Community Hospital, New Haven, Conn. (*9*), the group work with diabetic patients carried on in Boston by the city hospital and the Diabetes Field Research and Training Unit of the Public Health Service, and the group work with obese patients at Herrick Hospital in Berkeley, Calif., indicate some of the experiments. Group work with patients who have had coronary attacks has been proposed. Alcoholics Anonymous is working closely with some hospital clinics in group discussions with alcoholic patients. Group methods of education can be used to help parents of handicapped children learn how to work more successfully with their own children (*10*).

"Group activities" in this context does not mean classes in the traditional lecture form; it means, instead, ways of bringing people together to create situations in which they feel free to discuss their own reactions about the problems in question. They learn from each other and give support to each other. The classic study (*11*) with mothers of young infants on feeding orange juice and cod liver oil, done at the University of Iowa Hospital, brought out clearly the advantage of decision-discussion methods. In such group discussions, incorrect ideas are likely to be rejected by the group; people are strengthened by group attitudes of their peers and supported in changing or in tentative new convictions.

Leadership for this kind of group discussion is a skill. Only recently has it been taught in school. Moreover, new studies in group discussion methods are going on all the time. The clinic staff which is interested in exploring this method would be well advised to consult with local resources for help in adapting these skills to their special needs.

Another Challenge

Not many in public health or hospital administration are specialists in education methods or have the skills of social scientists. As in the medical field where general practitioners sometimes fail to recognize a symptom which a specialist would spot at once, so in the education field it is easy to miss significant opportunities for education. Social scientists can be called on for help on problems in these fields. More and more hospitals are asking educators or sociologists to observe their practices and to suggest more effective ways of working. The demand is growing for consultation and service from anthropologists, health educators, adult educators.

These different professional groups will not provide a common body of accumulated knowledge with ready-made answers. The professions are advancing together into new, experimental, and more profound ways of working with people. Although these newer methods are not so well formed or definitive as the older academic ways of teaching, they can, when wisely used, offer greater satisfaction. Imaginative people in a clinic, who take their responsibilities thoughtfully, will be challenged to find out from day to day what the patients are learning and to enhance that knowledge positively.

It is important for everyone to become more familiar with the nature of the cultures and the ways of life of others: their goals in life; their values, beliefs, traditions, customs, and taboos with respect to health and illness. More

must be known about the objectives for which people are willing to strive and conversely, more must be understood about the aspects of life which mean very little to them. These understandings are not easy to acquire. Since understanding is limited or not always possible, perhaps respect for differences is an attitude to nurture.

The only people who are really going to do anything for the patient are the persons who work with him. Not everyone is equally ready to learn about health at all times. But there are times in a lifetime when an individual is ready. One such time is when he comes to the outpatient clinic for service.

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Legal Note on Water Pollution Control

A Connecticut trial court was authorized to modify an order of the Connecticut State Water Commission by extending the time within which the defendant was required to comply with the order in the case of *State Water Commission* v. *City of Norwich*, 107A 2d 270 (Conn. 1954).

The Connecticut Supreme Court of Errors construed a State statute authorizing judicial enforcement "by appropriate decree or process" of the commission's orders covering control of water pollution as giving the trial court authority to attach to its decree such conditions as it may in its discretion find necessary for the adequate enforcement of the order. The court held that the additional time was necessary to make the decree appropriate and effective since the date set in the commission's order had expired.

Accordingly, the change in dates was held not to be a material change in the commission's order and, consequently, was a proper exercise of the broad equity powers of the trial court rather than an attempt by it to exercise administrative functions.

Fluoride and Nonfluoride Enamel Opacities

By EUGENE R. ZIMMERMANN, D.D.S.

DEVELOPMENTAL OPACITIES in enamel associated with fluoride ingestion have been termed "fluorosis." Dean (*1*) has thoroughly studied these opacities and has established criteria for classifying them. There are also enamel opacities, not attributed to fluorine, which occur in low-fluoride areas; these have been described (*2*, *3*) but have not been categorized.

This report compares the prevalence and distribution patterns of enamel opacities in a fluoride area and in a nonfluoride area. The positive signs of fluorosis ("very mild" to "severe") have been identified readily in epidemiological surveys. However, differentiation of questionable fluorosis opacities from the nonfluoride lesions has occasionally been difficult (*4–6*). This study presents several methods of distinguishing between these two types of enamel opacities.

Methods

Aurora, Ill., and Montgomery and Prince Georges counties in Maryland were the areas selected for this study. In each locality continuous resident white children 12–14 years old were examined for dental caries experience and dental fluorosis within a few months of each other. The same forms, procedure, and equipment (mirror and explorer, Castle light) were used in each community. All children in a school were examined and only after completion of the dental examination were residencies checked for continuity. Children who had consumed water from the municipal supply continuously from birth through their 11th year, and whose absences were judged to be only vacation trips, were considered continuous residents.

In Aurora, appoximately 650 children were examined. Of these 352 met the criteria for residency. In the Maryland counties 220 of about 800 students examined fulfilled the requirements.

Water History

Maryland Counties

The study areas in Maryland, adjacent to Washington, D. C., have had as water sources for more than 25 years the Northwest Branch of the Anacostia River and the Patuxent River. The filtration plant for the Anacostia River was completed in 1936; the Patuxent plant was placed in operation in 1944. Water treatment has been the same at both plants since their inception and consists of aluminum sulfate flocculation, prechlorination, sand filtration, alkalization with hydrated lime, and postchlorination. Fluoride determinations have been performed only in the past several years and the average concentration of the raw water has been about 0.2 p.p.m. According to the water engineer (*7*), the fluoride level of the water at the tap was practically zero due to this type of water treatment. There have been no

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Table 1. Comparison of fluorine concentration, community fluorosis index, DMF rate, and number of children examined in the Maryland counties (1953) and in Aurora, Ill. (1941, 1953)

Locality and year	F in p.p.m.	Community fluorosis index	Standard error	DMF [1] rate	Number of children by age last birthday			Total number of children
					12	13	14	
Aurora, 1941 [2]	1.2	0.32	[3] 0.02	2.8	208	225	200	633
Aurora, 1953	1.2	.32	.01	2.9	114	123	115	352
Maryland, 1953	.2	.00	.00	6.4	68	63	89	220

[1] Number of decayed, missing, and filled permanent teeth per person.
[2] Data from Dean, H. T.: Epidemiological Studies in the United States. *In* Dental Caries and Fluorine, edited by F. R. Moulton for the American Association for the Advancement of Science. Lancaster, Pa., The Science Press 1946, pp. 17–23.
[3] Computed from data, footnote 2.

important variations in the inorganic constituents of the tap water over the past 15 years, until 1 year prior to these dental examinations, when fluoridation was instituted (*7*).

Aurora, Ill.

The Aurora water supply, obtained from a number of deep wells drilled into Cambrian "Potsdam" sandstone, has a reliable fluoride constancy back to 1898. Dean found on the average 1.2 p.p.m. F (*8*). There have been no major changes in this water system for the past 40 years, and it is not treated except for chlorination in times of emergency.

Criteria

Enamel opacities have been classified as forms of "hypoplasia" (*3*), "dystrophy" (*9*), and "dysplasia" (*10*). They will be designated in this report as either "fluorosed" (fluoride) or "idiopathic" (nonfluoride) white spots.

Dean's criteria for identifying fluorosed opacities were applied in both groups of children. Dean has described questionably fluorosed anterior teeth as having thin, irregular opaque streaks or flecks on their surfaces while the posterior teeth display opacities, 2 or 3 millimeters in extent, on the tips of their cusps (*5*). He also asserted that these white spots were not sufficiently developed to be classed as "very mild" and were definitely not "normal" (*1*). All enamel lesions not meeting Dean's criteria were classified as nonfluoride. If a child had both fluoride and nonfluoride opacities on the same tooth or in the same dentition, he was classified only as having fluorosis (*5*). Each opacity was classified solely on the basis of its physical appearance.

Findings

The number of teeth present in the Maryland and Illinois children was compared, and the

Table 2. Number of children with normal teeth, and with teeth showing various types of opacities, in Aurora, Ill., and two Maryland counties, 1953.

Locality	Number of children	Opacities by specified types									
		None		Idiopathic		Questionable fluorosis		Very mild fluorosis		Mild fluorosis	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Aurora, Ill.	352	169	48	33	9	92	26	51	15	7	2
Two Maryland counties	220	141	64	79	36	0	0	0	0	0	0

Figure 1. Children with normal teeth and those with tooth opacity in Aurora, Ill., and two Maryland counties, percentage on a child unit basis.

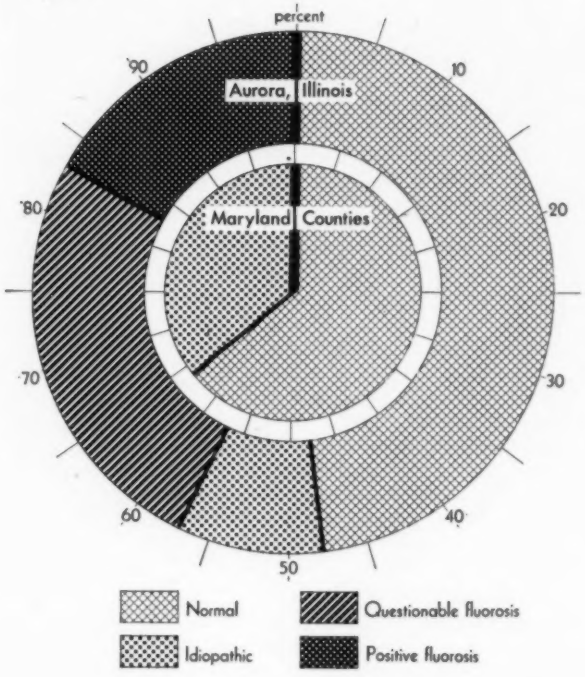


Figure 2. Permanent teeth with normal structure and those with tooth opacity in Aurora, Ill., and two Maryland counties, percentage on a tooth unit basis.

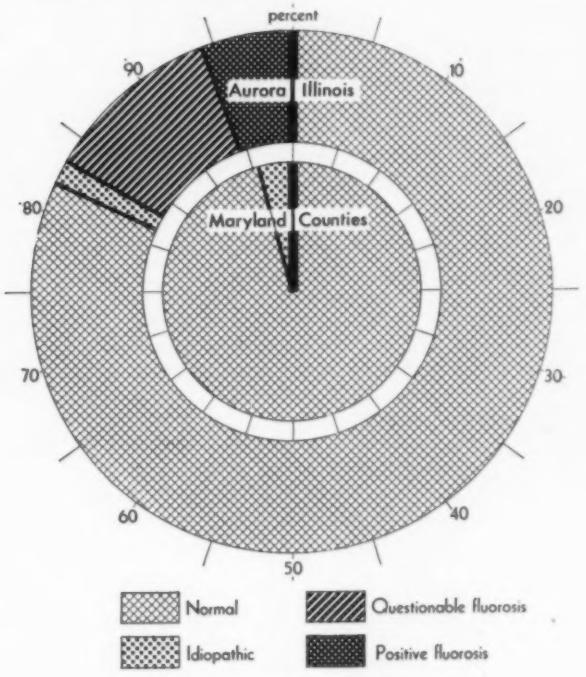
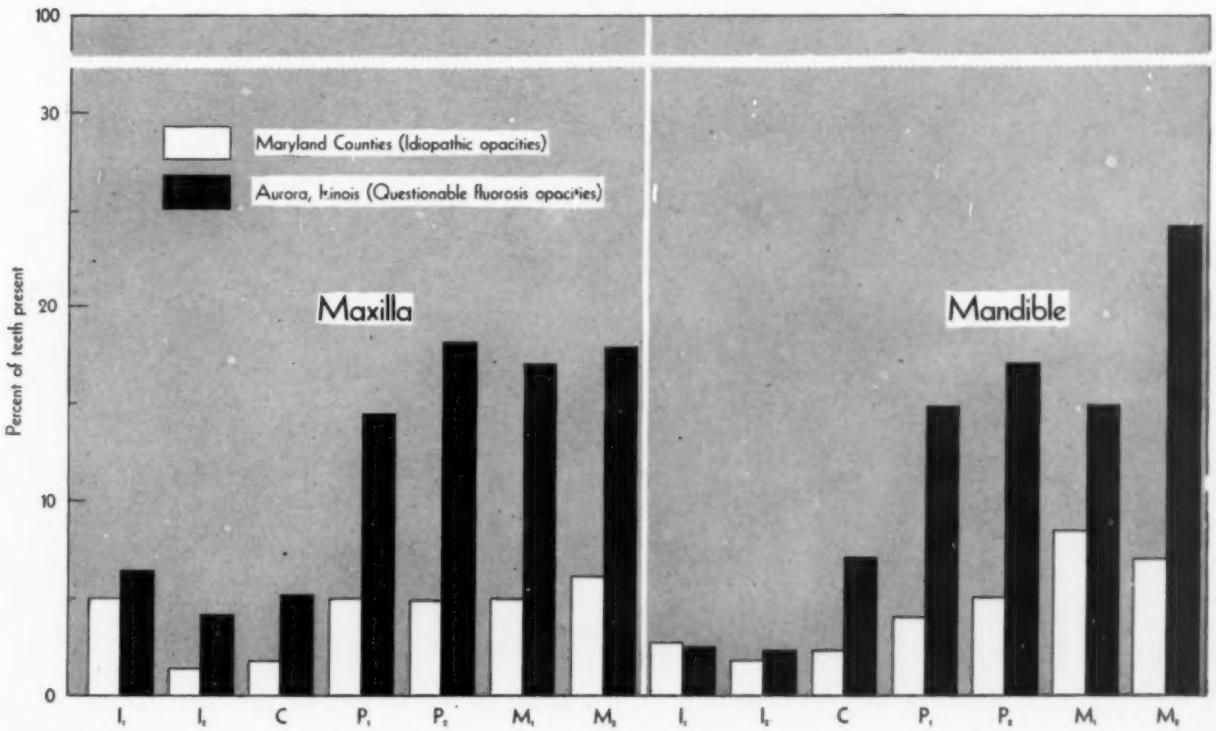


Figure 3. Permanent teeth with opacities in Aurora, Ill., and the two Maryland counties, percentage on a tooth unit basis by tooth type.



small difference was found to be due to chance variation.

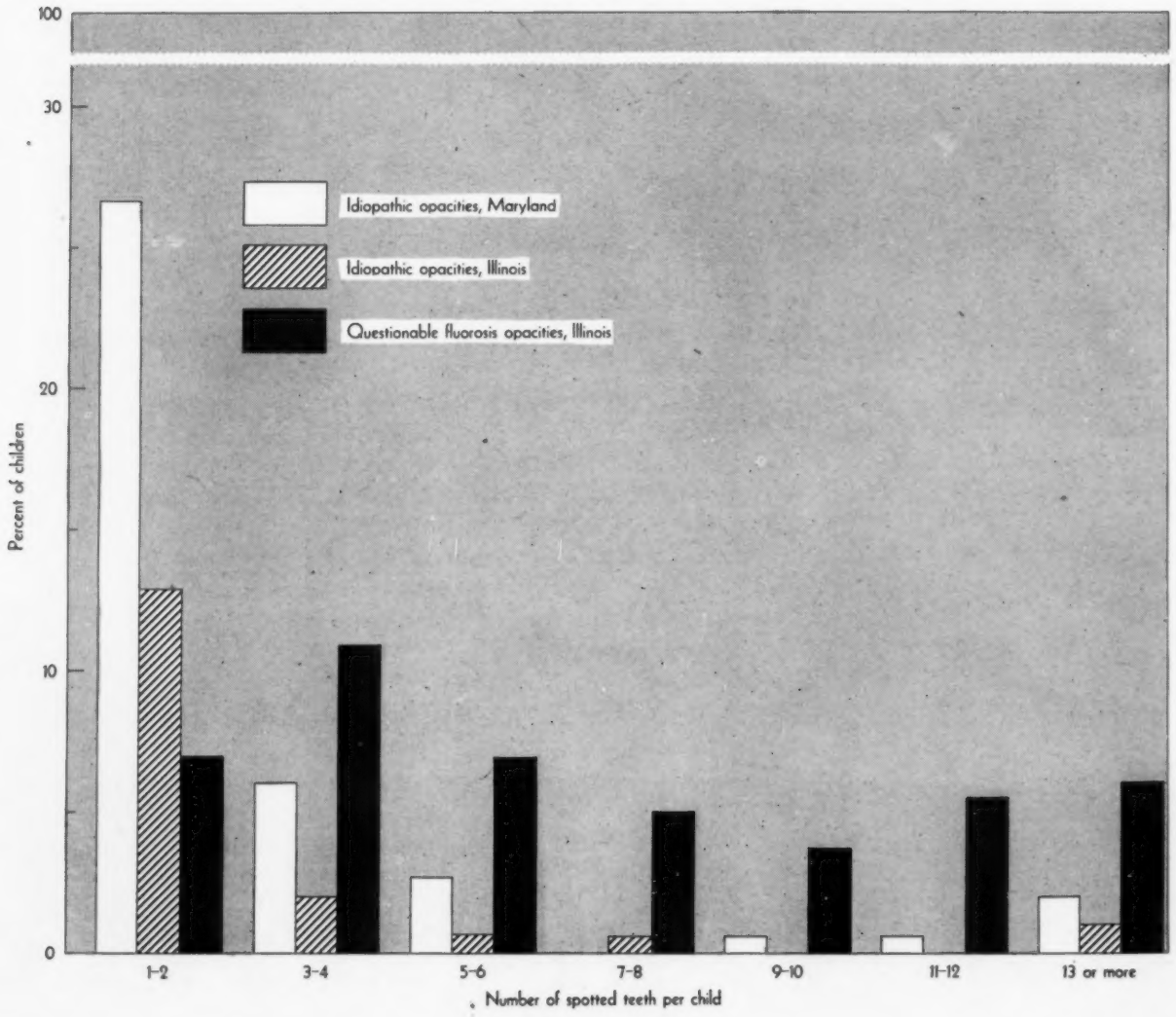
The dental caries experience and the fluorosis indexes in Aurora are similar to previous findings (table 1). The DMF (decayed, missing, or filled permanent teeth) rates offer confirmatory evidence of fluoride exposure. The community fluorosis index was computed from the data in table 2 and this table shows that most of the children with positive signs of fluorosis had the "very mild" form.

According to Dean's criteria, 43 percent of the Aurora children had fluorosed opacities; 9 percent had nonfluoride white spots (fig. 1).

By contrast, in Maryland, only two children with fluorosed opacities were seen, but they were not continuous residents of the study area, hence, not counted. Nevertheless, enamel opacities were seen in 36 percent of the continuous resident Maryland children. These white spots (idiopathic) were not associated with fluoride exposure.

Regardless of the kind of opacity, only a small percentage of the teeth of children in both places were afflicted with enamel lesions (fig. 2), and usually the posterior teeth were most frequently affected (fig. 3). The distributions of idiopathic and questionably fluorosed opacities by morphological tooth type were similar. The teeth with idiopathic lesions in Aurora were

Figure 4. Number of spotted teeth per child with idiopathic opacities in two Maryland counties and with idiopathic and questionably fluorosed opacities in Aurora, Ill.



omitted from this graph due to their small numbers, but their distribution was similar to the Maryland pattern.

The Maryland and Aurora children whose teeth had opacities diagnosed as idiopathic usually had one or two spotted teeth per dentition whereas the children with questionably fluorosed teeth had 3 or more affected teeth per dentition (fig. 4). This frequency of spotted teeth per child was utilized in classifying those Aurora children who had enamel opacities that were difficult to classify solely on appearance. This group, 6 percent of the children examined, was not placed in either category at the time of examination, but the lesions were later classified as idiopathic after their frequency appeared similar to the idiopathic pattern.

Discussion

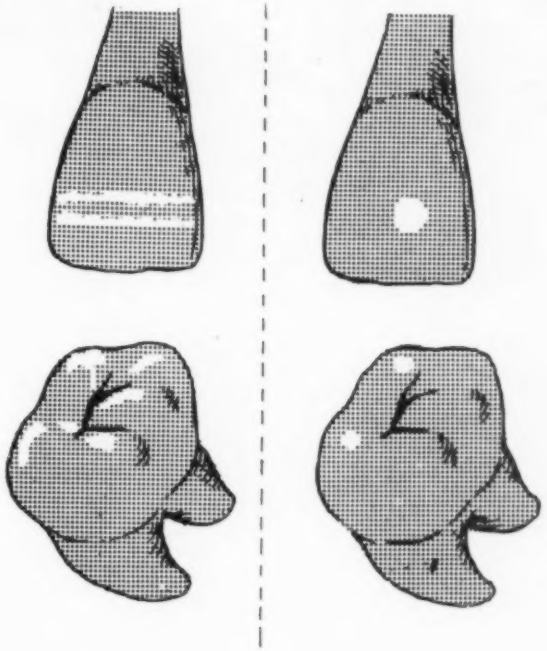
In the present study, if the Maryland opacities were erroneously considered as questionable fluorosis, the community fluorosis index would be 0.17. If the idiopathic opacities in Aurora were classified as "normal," the community fluorosis index would be 0.32; if they were classified as "questionable" fluorosis, the index would be computed as 0.36. In either case, the index would not be raised sufficiently so as to approach the threshold range (*1*) of objectionable fluorosis (0.40–0.60).

In one study the prevalence of nonfluoride opacities has been reported as about 83 percent in a community in which waterborne fluorides were not present (*2*). If these nonfluoride opacities were mistakenly diagnosed as questionable fluorosis, the community index would be estimated at 0.42, which is within the borderline zone of objectionable fluorosis. Therefore, the differentiation of these two types of opacity may be important in evaluating the effects of a fluoridation program in some communities.

Three features of enamel opacities facilitate the differentiation of fluoride and nonfluoride white spots:

The physical appearance of the opacities. The idiopathic opacities are usually more oval in shape and more opaque in appearance than questionably fluorosed white spots, whereas the opacities on questionably fluorosed teeth have

Figure 5. Appearance of questionable fluorosis lesions (left side) and nonfluoride opacities (right side).



a tendency to form horizontal striations. On the occlusal surfaces of posterior teeth the nonfluoride lesions involve the cusp tips, similar to snow-capped mountain peaks, while the striae of questionably fluorosed teeth extend down cuspal ridges. These characteristics are shown in figure 5.

The distribution pattern of the opacities. Questionably fluorosed opacities are usually distributed bilaterally in a dentition; idiopathic lesions are not ordinarily found in a definite symmetrical pattern.

The frequency of the opacities per person. The questionably fluorosed opacities usually involve several teeth per dentition; idiopathic lesions seldom affect more than 1 or 2 teeth.

Summary

1. Continuous resident, white children, 12 to 14 years old, were examined in Aurora, Ill. (water, 1.2 p.p.m. F), and in two Maryland counties (0.2 p.p.m. F) for dental caries experience and fluorosis. The Illinois children had a DMF (decayed, missing, or filled permanent teeth) rate of 2.9 and a fluorosis index of

0.32; the Maryland children had a DMF rate of 6.4, and no fluorosis was observed.

2. Two kinds of enamel opacities were seen: those frequently accompanying fluoride ingestion (positive and questionable fluorosis) and those of unknown or unassociated etiology (idiopathic or nonfluoride). The first kind of opacity, observed only in Aurora, had affected 43 percent of the study group (17 percent were "very mild" or "mild" and 26 percent, "questionably" fluorosed). The second kind of opacity was observed in 9 percent of the Aurora children and in 36 percent of the Maryland group.

3. The differentiation between questionably fluorosed and idiopathic opacities was accomplished by observation of physical appearance in 94 percent of the cases, and by attention to pattern and frequency in the remainder.

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PHS Advisory Council Appointments

Dr. Francis F. Heyroth, Dr. Maurice J. Hickey, and Jack B. Beardwood were recently appointed to the National Advisory Dental Research Council, National Institute of Dental Research, Public Health Service.

Dr. Heyroth, who received his M.D. from the University of Cincinnati in 1925 and his Ph.D. in 1929, is associated with the College of Medicine's department of preventive medicine and industrial health. He has had wide experience in industrial medicine, including the assistant directorship of the university's Kettering laboratory of applied physiology. A biochemist, Dr. Heyroth has specialized in protein chemistry, nutrition, and the toxicology of industrial substances.

Dr. Hickey is associate dean of the faculty of medicine, Columbia University, head of the university's division of oral surgery, and executive officer of its department of dentistry. He is also director of the New York State Board of Oral Surgery, assistant attending surgeon at Presbyterian Hospital, and consultant in oral surgery at Kingsbridge Veteran's Hospital.

Mr. Beardwood, a native of Canada, served as special assistant to the Secretary of Health, Education, and Welfare in 1953. He is now an administrative associate of the architectural firm of Welton Becket and Associates. Mr. Beardwood received a degree in journalism from the University of Washington and has been associated with western newspapers, the United Press, Associated Press, and *Time* and *Life* magazines.

Dr. Irving S. Wright, professor of clinical medicine at Cornell University Medical College and attending physician at New York Hospital, has been appointed to serve on the National Advisory Heart Council, National Heart Institute, Public Health Service. He was president of the American Heart Association during the 1952–53 term and chairman of the First National Cerebral Vascular Conference of the American Heart Association held this year. As a clinician, author, and editor, Dr. Wright has had wide experience in the field of heart and blood vessel diseases. He is a civilian consultant in medicine to the Surgeon General of the United States Army and governor of the American College of Physicians. He served as a member of the National Research Council Committee of the American Board of Internal Medicine from 1940 to 1949.